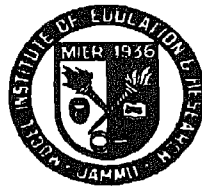


COMPARATIVE PROFILES OF ADOLESCENTS WITH DIFFERENT TALENTS IN TERMS OF SOME SELECTED VARIABLES

**A Research Project Sponsored By The National Council
Of Educational Research And Training New Delhi**

R E P O R T



**PROJECT DIRECTOR
DR. ARUN K. GUPTA
DIRECTOR MIER**

**SR. RESEARCH INVESTIGATOR
NALINI SRINIVASAN**

1988

**MODEL INSTITUTE OF EDUCATION AND RESEARCH
B. C. ROAD, JAMMU—TAWI (180 001)**

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I sincerely hope and believe that the present research shall be found useful for understanding the profiles of adolescents endowed with high Mathematical Creativity, Scientific Creativity, Entrepreneurial Creativity and General Creativity

respectively in terms of key social, psychological and educational variables - with the ultimate objective of nurturing their many splendoured talents for the benefit of the creative minority as well as our society.


(Dr. Arun K. Gupta)

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CHAPTER ONE

1.1. THE PRESENT PROBLEM

The problem taken for the present investigation reads as :

COMPARATIVE PROFILES OF ADOLESCENTS WITH DIFFERENT
TALENTS IN TERMS OF SOME SELECTED VARIABLES

1.2. NEED AND SIGNIFICANCE OF THE STUDY

The present research investigation was undertaken with the realization that creative individuals in various fields need to be identified at the +2 stage; that profiles of adolescents talented in various fields of creativity with special reference to scientific, mathematical, entrepreneurial and general/overall creativity need to be studied to distinguish one group from another, and that, special educational programmes for nurturing talent need to be devised for the creative adolescents. The justification for investigating the above problem can be discussed from three important angles. These are given below :

1.2.1. SOCIAL POINT OF VIEW

Creativity is not an isoteric ability limited to a selected few. It is an ability with which everyone is imbued. At the same time, it is true that only a few are capable of making highly creative contributions in a particular field of activity. Creativity is essential for adaptation to life's demands and represents, man's most pervading hope for survival and progress (Toynbee, 1953). Creative insights are an essential part of the survival process and creativity may hold the key to the stability and prosperity of the future society (Petroska, 1983). It encompasses qualities like "imagination", "intuition", "inventiveness", "discovery", "far-sightedness", "giftedness", "originality" and "extraordinary effort",

that bring new and significant things into existence. These contributions may be in the form of new ideas, devices, products, systems and organizations. It is, in fact, in and through the creative problem solving process alone that mankind has taken available energy, materials and information from the environment and transformed them in specific ways, to improve efficiency and productivity in all spheres of activity - personal, social, intellectual and general. It is no wonder that creativity in man has been extolled as mankind's ultimate asset (Torrance, 1957).

Systematic efforts to nurture creativity as part of human resource development for national growth received great fillip in all countries in the second half of the present century. All countries, both developed and developing, are convinced today, that their survival and future progress would be determined to a large extent on how, and to what extent, they can conserve and develop the precious creative potential among their budding citizens. India is no exception to this realization.

Ours is a developing country and we need creative leadership which can think of solutions to the mind boggling problems baffling the country, viz ; brain-drain, illiteracy, neglect of women and other depressed classes, malnutrition, lack of access to early stimulation, educational wastage and stagnation, unemployment and teeming poverty¹.

1. According to the latest statistics furnished in the documents, "Challenges of Education : A Policy Perspective (1985), and Programme of Action (1986).

a) The drop-out rate between grades 1-6 is 60% and between grades 1-8 is 75%.

b) The number of illiterates in the country increased four-fold from 6 crores in 1951 to 24.8 crores in 1981. According to the World Bank estimates, India would have the largest concentration of

The startling figures given in the footnote highlight the barriers to educational, individual, social and national development. Time, therefore, seems to be ripe for launching systematic investigations like the present one for throwing light on the ways and means for maximizing individual and national productivity within our democratic set-up by studying the different kinds of talents with which citizens are imbued.

illiterate population in the world by 2000 A.D. and 54.8% of the world's illiterate population will be in the age-group 15-19.

c) There is a glaring disparity between male and female literacy, the former being 46.9% and the latter 24.8%. Women comprise 57% of the illiterate population. 70% of the non-enrolled children at school stage are girls.

d) The All India literacy rates of Scheduled Castes/Scheduled Tribes are 21.38 and 16.35% respectively as against 41.20% of non SC/ST population according to the 1981 census. The proportion of enrolment of SC/ST children continues to be much less than their population proportion and the drop-out rate continues to be very high at all levels of education.

e) The infant mortality rate stands at 104 (1984). 83% of children have body weights below normal standards. These include 42% mildly malnourished and 6% severely malnourished.

f) The current intake in the vocational stream is of the order of 72,000. Only 25% of students' population entering higher secondary stage is covered by vocationalization so far.

g) The variability in the standards of education is also a cause for concern. The extent of wastage involved in the present pass percentage ranging from 30 to 40 is quite high.

It has rightly been pointed out that the character, quality and viability of society's institutions largely determine whether potential creativity can blossom in it or not. Under adverse conditions, creativity may be stifled, stunted and stultified (Toynbee, 1951). Criticism has also been levelled from time to time, against prevailing societal attitudes, which are alleged to be conspicuously deadly to the development of creative abilities (Torrance, Barron (1952)). Among other factors the true function of a democratic society has, unfortunately, been misunderstood by many. Democracy does not mean, as some mistakenly think, providing "equal" opportunities to "all" individuals irrespective of the fact, whether they are capable or not. On the other hand, in a true democracy, equal chance is to be provided to individuals for developing their unequal capacities to the optimum level so that they may make a productive return to society by utilizing those capacities in a public spirited way and with a deep sense of social commitment. This can happen only when an atmosphere of understanding, confidence and cooperation is created between the potentially creative minority and the majority which lacks this ability. It is in this perspective that Thomas Jefferson's famous remark, "We must dream of an aristocracy of achievement arising out of a democracy of opportunity", can be appreciated. Hence, the need of the hour is to give utmost importance to the different programmes, whereby, creativity can be nurtured.

Social psychologists and self-theorists like Carl Rogers, Rollo May and Abraham Maslow have warned that individual creative ability, if repressed, may be diverted from "creation" to "retaliation". If and when this happens, it is likely to be a tragedy for the frustrated individual and the repressive society alike, and it will have been the society, not the individual that has been to blame, for this obstruction to God's or nations' purposes. "Societies", observes, Randolph Maccon, "cannot be easily and radically changed by human will according to plans. Rather, it is the creativity with which, the members of a society are endowed that accounts for the eternal dynamism of the society."

In the light of the foregoing discussion, it should be emphasized that our creative minority constitutes our most valuable national asset. Before it is too late for us to realise our folly and repent over the loss of timely and valuable contributions, which would have resulted from the potentially creative individuals, it seems apposite that determined efforts need and must be made to enable our children to develop their creative abilities during their formative years. Only then can huge personal and social wastage be minimized and a new hope for our nation dawn.

For obtaining best results, children need to be identified and nurtured in the best educational and supportive environments, in accordance with their attitudes, aptitudes, capacities, tendencies and talents. These should be assessed and identified as early as possible.

A significant feature of the present study happens to be the fact that the investigators have focussed attention upon talented children at the 10+2 stage of education in four main areas of creativity viz. scientific, mathematical, entrepreneurial and general. Batteriers of creativity tests have been specially developed and standardized, leading to the identification of the creative talent in the first three areas mentioned above.

Seldom have any similar attempts been made in the above direction in the past in the Jammu region of J&K State which is an educationally backward area and that too at the 10+2 stage of education which is the terminal stage for nearly 40% of the school going population. The present study therefore assumes great significance.

1.2.2. INDIVIDUAL POINT OF VIEW

According to Guilford - a pioneer in the field of creativity research, "Creativity like love is a many splendoured thing." Torrance, another prominent researcher, puts this idea in another form when he opines that, "It is possible to be creative in

innumerable ways, as there are endless ways in which creativity can manifest itself." Although all human beings have the same kinds of mental activities and obey the same basic psychological laws, they are far from being equal or identical in their make-ups. That is why people possess characteristics of different kinds, in different degrees, and in different combinations.

Original and creative capacities that are innate, when stimulated, or even merely allowed to develop, produce unusual abilities which result in significant differences among individuals. To illustrate, some people may turn out to be gifted musicians, others may become mathematicians, some writers, scientists and entrepreneurs. In fact, there is hardly any field of human activity in which individuals cannot be differentiated from each other. The practical problem therefore, becomes one of devising the best means of nurturing the talent which is latent in the individuals (Wolf, 1954).

Several studies have shown that out of all abilities with which an individual is endowed, his ability to create, is his biggest asset. But, this ability has a maximum likelihood of getting discouraged during the early years. Commenting on this, Kravetz (1970), remarks,

✓ "The creative child may experience conflict as he moves through his school years, clashing sporadically with his peers, teachers, with the school administration and many receive little support from the parents. The creative child may go unrecognized or he may be on his way to vestigial creativity. His unused power becomes flaccid, suppressed and ultimately, like the vermiform appendix or the caudal vertebrae, it is probably there but of no apparent use."

Several studies have shown that, under adverse circumstances during early years of life, creativity can be thwarted and discouraged. This, along with fear of disapproval and shyness, may force the budding, gifted scholar, inventor, scientist, mathematician

or entrepreneur, to suppress his uniqueness to "get along with the team". Such a situation is, to put it mildly, grave and disastrous for the mental health and actualization of the potentially creative person (Rogers 1954).

It is all the more important therefore, that people who are at the helm of affairs, psychologists and educational experts, should put in determined efforts to enable our children to develop their creative abilities during their early years and at the school stage itself, so that huge personal wastage may be minimized and maximum benefits accrue to the individual and society alike. For obtaining best results, observes the report of the Indian Education Commission (1966), ".....talent has to be located early and allowed to grow in the best of atmospheres and under the best teachers."

Not only this, what we require today is an infrastructure and commitment to identify creative individuals in different spheres so that really top class contributions in different areas can be ensured. The question to be confronted today is, "Are we doing justice to creative individuals in general?" The basic purpose behind this query, is to highlight the importance of systematic efforts, and provision of a conducive environment for creativity development and thereby optimizing individual happiness, satisfaction and adjustment.

The emphasis in the present study is on systematic identification of creative children in four different fields (mathematics, science, entrepreneurship, and general creativity), at the 10+2 stage in education. It is important to know what distinguishes say, a potentially creative mathematician, from a creative scientist, or an entrepreneur, and in what ways are these individuals different from those who score high on tests of general creativity.

The present investigation provides a practical possibility, through specially developed tools, to identify creativity in as many as four important spheres, viz : scientific, mathematical, entrepreneurial and general creativity. In addition to this, profiles of highly creative individuals in the field of mathematical, scientific and entrepreneurial creativity have been delineated in terms of key psycho-social and academic variables which should go a long way in understanding how individuals in these groups differ from each other.

In our country similar investigations have hardly been undertaken for providing differential profiles of creative pupils in the above fields and that too at the 10+2 stage of education.

1.2.3. ACADEMIC POINT OF VIEW

Although philosophers, psychologists and educationists have studied creativity and different aspects related to it from time to time under such headings as "imagination", "intuition", "inventiveness", "discovery", "far sightedness", "giftedness" and "originality", yet, most of the scientific studies in the field of creativity were undertaken only in the later half of the present century, specially during the last two decades. Infact, "creativity" is considered to be one of the most important and fertile fields for research today and one which is not likely to be discarded and "tossed upon junk heaps of educational fads (Treffinger, Reuzulli and Feldhusen, 1971).

The number of empirical researches in the domain of creativity in the western countries showed a marked increase since the 1950's, synchronizing with the launching of the Soviet Sputnik. Almost overnight, in developed nations, creativity development was given topmost priority, and many studies were launched in which the nature of creative abilities, profiles of creative personalities, measurement of creativity, the evaluation of creative process and products were made subject matters of study. The area is however, relatively new for research, more so for

developing nations as not much research effort has been focussed on all aspects of the topic. Reviewing the researches on creativity, Freeman, Butcher and Christie (1971) aptly observed :

"Largely, as a direct result of the extensive work carried out during the past decade or so, the concept of creativity has become important, sometimes indeed a cult, in educational and psychological thinking. Even the most perfunctory semantic analysis, however, suggests that this concept as commonly employed is amorphous and indefinite, its relationship with longer established concepts in education and psychology is vague and loose and its use by both educators and psychologists is highly individualistic. Current views on the nature of creativity differ widely..... there is as yet no unified psychological theory of creativity available to the research worker or educational practitioner.....the immaturity of research in the field is partly due to the difficulty of studying such multifarious and high level phenomenon."

The above situation has continued even till the late eighties

Although a considerable number of research studies have been conducted in the field, a lot yet remains to be known about the complicated creative processes, mysteries of creative behaviour, measurement and structure of creative abilities, emergence of creative products and dynamics of creative personality etc.

A review of literature on creativity till 1980 reveals that, in majority of studies, batteries of tests of creativity based on the lines of Guilford, Torrance, Wallach and Kogan, have been utilized for identifying groups with high creativity. However, in the past decade or so, the creativity researchers gradually realized that, creativity, like intelligence, may not be a general ability and since people are creative in different fields, it may be because people are imbued with different kinds of creative abilities.

This line of thought has led to several investigations wherein efforts to identify highly creative individuals in the field of ' mathematics, science, technology, fine arts, literature, entrepreneurship etc.' have been made. In India, however, researchers have by & large continued to bank on tests of creativity of a general nature.

The current investigation can be claimed to be likely to be trendsetting in that the investigators have made an effort to differentiate between four different types of creativity namely : scientific, mathematical, entrepreneurial and general among adolescent at the +2 stage. In all humility, the present investigation can be claimed to be probably the first Indian study wherein individuals with four types of creative talents have been studied, at the +2 stage of education which has been adopted as the pattern of education at the national level in the New Policy on Education (1986). Atleast no such study has been attempted before in the J&K State.

In addition, an attempt has been made to delineate the psycho-social and academic profiles of high and low creative adolescents in four important domains of creativity. This is likely to be a noteworthy addition to our current knowledge about the personal, social and psychological characteristics of creative individuals.

Another significant conclusion which can be drawn from creativity researches conducted in our country is that, the nature of relationship between creativity (scientific, mathematical, entrepreneurial and general) and other non-cognitive variables like self-concept, intelligence, inter-personal relations, study-strategies, self-initiated activities, remain to be firmly established. The present study augments knowledge in this hitherto unexplored area.

Due to the general lack of appropriate, valid and reliable tools for measuring creativity-tools which should have been exclusively developed and standardized on Indian samples - Indian researchers had to fall back upon the tests developed on the lines Torrance and Guilford (Passi, 1971, Gupta, 1974, 1985). In the present study, tools for measuring creativity have been specially developed and standardized, making the investigation one of potential importance for prospective researchers. It is hoped this would lead to the opening of new avenues for promoting further research in the fascination domain of creativity.

1.3. OBJECTIVES OF THE STUDY

1. To identify and ascertain the incidence of scientific, mathematical, entrepreneurial and overall creativity among pupils at the +2 level of education, in Jammu City.
2. To delineate profiles of the adolescents with high overall creativity as also high creativity in the scientific, mathematical and entrepreneurial fields with respect to variables namely, locus of control, self-concept, interpersonal relations at home and school; study habits, self-initiated activities, vocational preferences and scholastic achievement respectively.
3. To fit in a regression equation involving scores of locus of control, interpersonal relations, study habits, self-initiated activities, intelligence and scholastic achievement respectively to predict creativity in different fields.
4. To study the inter-group differences among adolescents with high and low creativity in different fields with respect of marker variables, namely sex, intelligence, and achievement respectively.

1.4. QUESTIONS POSED FOR THE STUDY

The study being exploratory in nature, no precise hypothesis have been laid down. However, a few fundamental questions have been posed, answers to which are elicited through the proposed study. These are :

1. Can adolescents with high scientific, mathematical entrepreneurial and general creativity be identified adequately at the 10+2 stage of education and differentiated on the basis of conventional creativity dimensions, namely, fluency, flexibility, originality and elaboration respectively?

2. Do significant inter-group differences exist within the pupils with high and low creativity in the four fields enumerated in (i), with respect to intelligence, achievement, locus of control, self-concept, interpersonal relations at home and school, study-habits, self-initiated activities and vocational preferences respectively?

3. Is it possible to predict creative abilities at the 10+2 level, on the basis of scores obtained by individuals on the selected variables viz. locus of control, intelligence, interpersonal relations at home and school, study-habits, self-initiated activities and scholastic achievement respectively?

1.5. OPERATIONAL DEFINITIONS

1. ACHIEVEMENT

By achievement, was meant scholastic achievement.

Operationally, the index of achievement for an adolescent was taken in terms of the mean achievement score (converted into a percentage figure) obtained by an adolescent in the previous annual examination conducted by the J&K State Board of School Education.

2. INTELLIGENCE

Intelligence was operationally defined as a general mental ability.

An index, of intelligence was derived in terms of the scores obtained by an individual on "Jalota's and Tandon's General Test of Mental Ability".

3. SCIENTIFIC CREATIVITY

Operationally, the term scientific creativity was defined as a special type of creativity differentially distributed among

individuals gifted with creative talent in the scientific field.

An index of scientific creativity was derived in terms of the scores on "Tests of Scientific Creativity", specially developed and standardized for the present study.

4. MATHEMATICAL CREATIVITY

By mathematical creativity, was operationally meant, a special type of creativity differentially distributed among individuals gifted with creative talent in the mathematical field.

An index of mathematical creativity for an adolescent was derived in terms of the scores on the "Tests of Mathematical Creativity", specially constructed and standardized for the study.

5. ENTREPRENEURIAL CREATIVITY

By entrepreneurial creativity, was meant a special type of creativity, differentially distributed among individuals gifted with creative talents in the field of commerce. An index of this was derived from scores on "Tests of Entrepreneurial Creativity" specially developed and standardized for the present investigation.

6. GENERAL CREATIVITY

General Creativity was operationally defined as overall creativity potential, distributed differentially among individuals. An index of this was derived from scores on "MIER's Tests of Creativity" (Verbal & Non-Verbal).

7. LOCUS OF CONTROL

Operationally, the term locus of control was defined in terms of personal control a person has over the reinforcement and rewards that follow action and efforts.

The index of locus of control was derived in terms of scores on "Rotter's IE Scale" as adapted in Indian conditions by Aggarwal.

8. SELF-IMAGE

By self-image was meant the organization of all that the individual refers to as "me" "I" an index of which was derived from Deo's Abridged Personality Word Checklist (PWL).

9. INTERPERSONAL RELATIONS

Inter-personal relations were operationally defined as patterns of socio-personal relationship which an individual has with (i) parents; (ii) teachers; (iii) siblings and (iv) peers and friends both at school and home respectively.

The index of inter-personal relations were obtained in terms of the scores on "interpersonal relations questionnaire" (IRQ) specially constructed for the present study.

10. VOCATIONAL PREFERENCES

By vocational preferences was meant the aspiration of the individuals for certain occupations information about which was derived from MIER Vocational Preference Checklist constructed by Gupta et al (1974).

11. SELF-INITIATED ACTIVITIES

Self-initiated activities were operationally defined as leisure time activities initiated by the individual himself. An index of these was obtained through an adapted version of Torrance's Things Done on Your own Checklist by Passi (1971).

12. STUDY HABITS

By study habits were meant the styles and strategies of study adopted by an individual. An index of study habits was derived from

The scores on Study Habits Inventory specially developed for the present investigation.

1.6. LIMITATIONS OF THE PRESENT STUDY

The present study being exploratory and normative in nature, had the following limitations :

- i) The investigation was limited in that, identification of four types of creativity namely, scientific, mathematical, entrepreneurial and general was made on a sample of boys and girls studying only in the higher secondary schools and that took in one particular city (Jammu).
- ii) The present study was conducted on only those pupils in the 10+2 (higher secondary) schools, whose ages ranged from 13 to 18 years.
- iii) The study was restricted to a sample of 2400 adolescents.
- iv) The analysis of the results in the present study was limited to the dimensions in terms of which scoring could be carried out on different batteries of tests of creativity and other tests and tools for data collection group differences in creativity on sex and age were not taken up for analysis in the present study.
- v) The processing of data and analysis were limited by constraints of time, resources and objectives of the study.

CHAPTER TWO

THEORETICAL FOUNDATIONS

2.1. CONCEPT OF CREATIVITY:
INTRODUCTION

Generally, "Creativity" is associated with the work of outstanding artists, scientists, inventors and writers.

They need not necessarily be geniuses, but their productions do show sufficient originality or importance to win considerable acclaim or recognition. However, in recent years, creativity has become somewhat of a catchword and we hear of "creative" toys for children, "creative" meals, "creative" advertising and so on. Perhaps, there is some relationship or similarity between the productions of a Leonardo da Vinci and those of the householder who designs his garden, a dress maker or a housewife preparing a delicious 'soup' according to her own recipe.

The eternal dynamism of human race, whereby, man has not only managed to survive on earth, but has also made outstanding progress, in all fields to crown himself, 'Lord of Creation', is nothing but a rich tribute to one of his unique abilities - his capacity to 'create'. It is this creativity in man, which has, on the one hand, differentiated him from other creatures of the world and has at the same time kindled in him a spirit of 'nusus'.

The process of creativity is traditionally regarded as something 'mysterious' and 'divine' and, only recently, has there been an organized effort to study it scientifically. As a result of this, today we know fairly well, about the concept of creativity, the structure of creative abilities, the dynamics of the creative process, the creative product and characteristics of the creative personality etc.

2.2. DEFINITIONS OF CREATIVITY

Generally speaking, psychologists have tried to define creativity in terms of :

- i) A mental ability consisting of many component abilities;
- ii) A capacity to do things or produce something of a particular nature; and
- iii) A subjective experience or process having special characteristics.

Some representative definitions, falling in one or more of the above categories are given below :

a) "Creativity is man's capacity to produce new ideas, insights, inventions or artistic objects which are accepted as being of social, spiritual, aesthetic, scientific and technological value." (Jones 1953).

b) Wilson (1951), while offering an operational definition of creativity, synthesised the diverse meanings of the creative process prevalent at that time and gave the following main characteristics of creativity :

- 1) The outflow of individual or group through which a product is structured.
- 2) An action of the mind that produces a new idea or insight;
- 3) The mental process of manipulating the environment which results in the production of new ideas, patterns or relationships;
- 4) The capacity to produce, through thought or imagination, the capacity for original work;
- 5) The emergence in action, of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people or circumstances of his life on the other.

6) The mental processes that involve the rearrangement of post-experiences, with possibly some distortions, into new patterns, to better satisfy some expressed or implied need;

7) The process which results in a novel work that is accepted as tenable or useful or satisfying by a group at some point in time; and

8) The creative process is any process by which something new is produced - an idea or an object including a new form or arrangement of old elements. The new creation must contribute to the solution of some problems.

c) Vinacke (1952), viewed creativity to be dependent upon the integrated harmony between the external world of reality and an individual's internalised needs.

d) Rogers (1954) defined the creative process as "...emergence in action of novel relational product growing out of the uniqueness of the individual on the one hand and the materials, events, circumstances of his life on the other."

e) A comprehensive definition of creativity in recent years has been that of Drevdahl (1956). He considers it as the ability of human beings, to produce conclusions of a discretionary kind which are essentially new and were previously unfamiliar to the one who produced them. This can involve a synthesis of ideas which is more than a mere collection of thought. Creativity, according to Drevdahl, can mean the formation of new systems and new combinations from known information as well as transference of known connections to new situations and the forming of new correlations. A creative activity must be purposeful, directed, not useless and fanciful - although the product does not have to be immediately of practical use, nor perfect, not absolutely complete. It can assume an artistic, literary or scientific form or be connected with the implementation of technology of a methodical kind.

f) Good and Markel (1959) described creativity in terms of factors such as associational and ideational fluency, originality adaptive and spontaneous flexibility and ability to make logical evaluation.

g) Sir Frederick Bartlett (1958) employed the term "adventurous thinking" which he characterized as "getting away from the main track, breaking out of the mould, being open to experience and permitting one thing to lead to another", to explain the phenomenon of creativity.

h) According to Donald Mackinnon (1962), creativity fulfills at least three conditions; It involves a response that is novel or at least statistically infrequent. But, novelty or originality of thought and action is insufficient. True creativeness involves a sustaining of the original insight, an evaluation and elaboration of it, a developing of it to the full. Creativity, from this point of view, is a process extended in time and characterized by originality, adaptability and realization.

i) E.P. Torrance (1969) defined creativity as a process of "becoming sensitive to problem deficiencies, gaps in knowledge, missing elements and so on; searching for solutions, making guesses, or formulating hypotheses about deficiencies, testing and retesting these hypotheses, and possibly modifying..... them, and finally, communicating these results". This process consists of the abilities of being fluent, flexible, original and elaborative and is based on the study of creative individuals who possess the trait of creating to tell others about their discovery, invention or innovation.

j) George K. Bennet (1969) opines that to be creative is to have the quality or power of producing "effective surprise", "of causing" to come into being.

k) J.P. Jones (1972) defines creativity as "a combination of flexibility, originality and sensitivity to ideas which enables the

thinker to break away from usual sequences of thought, with different and productive sequences, the results of which give satisfaction to himself and, possibly, to others".

There is no denying the fact that the definitions given above highlight, in one way or the other, different aspects of the phenomenon of creativity. As such, their value for research is indeed immense.

It can also be seen that defining creativity is as complex a problem as defining the nature of human intellect. The concept of creativity has been a matter of debate for quite some time among the psychologists, but so far, no definition has emerged, which may be acceptable to all. A major source of confusion in creativity lies in the lack of conceptual clarity and disagreement among the researchers as to the meaning and nature of creativity. No wonder Yamamoto (1965) has defined creativity "like an elephant which blind men have been touching, describing in their own way".

In the words of Stein and Heiwze (1960) "there are those who believe that creativity or creative potential exists in each of us and there are others however, who criticize this group for permitting their democratic ideology to affect the study of the problem and who insist that few among us are truly creative.

It has also been pointed out that little effort has been made by investigators to synthesize the differing points of view and to offer a definition of creativity which may be comprehensive (Deo and Gupta, 1975). Some efforts have however, been made in the above direction. Deo and Gupta (1975), have offered a holistic definition of creativity which according to them, "seeks to bridge the different approaches". Creativity is defined by them as the "...capacity whether innate or cultivated, of an organism, to express his own self, in ways which are unique, novel, appropriate, productive and satisfying".

2.3. STAGES OF CREATIVE ACTIVITY

Some research workers have approached the problem of education and training in creativity by considering the ways in which creative thinkers describe their activities in writing e.g. a poem or novel, in carrying out scientific research, or in mathematical discovery. Some good examples of this type of approach, are found in studies by Ghiselin (1955), Mc Kellar (1957), Koestler (1962) and Poincare (Cited by Koestler).

Poincare suggests that creativity, discovery, sudden illumination, depend upon certain conditions :

- i) A protracted period of diligent, conscious work e.g., the collection of data, a definition of the problem, several attempts to reach the solution.
- ii) The role of the unconscious. which Poincare considers to be of prime importance. The emergence of an appropriate hypothesis which gives rise to a conscious reaction - a receptivity to the sub-conscious ideas which are distinctly relevant to the problem in hand.
- iii) The application of special techniques and methods to the ideas developed from sub-conscious levels. This final stage may call for considerable time and effort and may involve the solution of different if perhaps 'convergent' problems.

One particular research enquiry carried out to investigate the stages of creative thought, which merits mention here, is that of Patrick (1935), (1937), (1955). From her detailed experimental results, Patrick concluded that creative thought passed through several distinct stages similar, in fact, to those outlined by Poincare. Patrick listed the stages as follows

- a) Preparation : Where the subject makes himself familiar with the problem situation and its materials.
- b) Incubation : At this stage, the problem begins to form an outline and definition; suggestions as to possible solutions arise. It is possible of course, that these may be many and varied.
- c) Illumination : A specific goal is defined and the subjects begin to work towards it.
- d) Verification : The results are fully worked out, analyzed and completed. Other experimental investigations have tended in general, to support Patrick's conclusions. It has been suggested that, the stages of activity (as outlined by Patrick), do not always occur in a strictly sequential order. There are usually important differences in the ways in which individual thinkers work through the particular stages. One subject may work backwards and forwards through the stages before reaching a definite and complete solution. Another, may spend a long time over one particular stage and then turn back to an earlier stage in a deliberate way. Yet another individual may work through the four stages in a continuous movement which seems to embrace more than one stage at a time.

2.3.1. CREATIVITY : Like any mental ability, creativity has ITS DEVELOPMENT its characteristic developmental trends which have been studied extensively.

These trends have been established largely through a crosssectional approach in which creativity levels of the children have been studied in different age groups (Guilford, 1964).

The developmental curves for most of the abilities thought to be involved in creative thinking follow a pattern which is quite different from most other aspects of human growth, (Torrance 1962). Reviewing a number of earlier studies on the growth of

creativity and giving results from many studies conducted by himself at Minnesota, Torrance has described, at length, the developmental trends for creative abilities. The following are some of the general conclusions drawn on the basis of these studies :

2.3.1.(a) AGE-WISE DEVELOPMENT OF CREATIVE ABILITIES

A child begins to develop its imagination during the first two years of his life. He also shows signs of curiosity but how he expresses it, depends upon his unique characteristics. From age two to age four, the child develops a sense of autonomy, indulges in verbal and imaginative play, makes "new" discoveries for himself and explores his capacities and abilities. A typical child from four to six years has good imagination though it has also been observed that during these years, there is also a lessening of imagination. The skills of planning are learnt and persistence on the part of the child develops. After this, upto eight years of age, the child becomes aware of others' feelings and his realistic imagination develops. From eight to twelve years, the child develops his imagination still further and can use skills creatively in many areas. The faculty of critical reading gradually develops and a general restlessness is felt by the child. After twelve years of age, the spirit of adventure reigns supreme both, in social and emotional fields, seeds of nonconformity against adult rules and regulations are also sown during this period. This is continued till fourteen years of age after which, most of the imaginative activity seems to be focussed on the future career. The skills involved in creative problem solving are slowly learnt during this period though adventure still occupies an important part in life. However, peer acceptance and unstable nature of interests and aptitudes may dampen the creativity of sixteen years old boys and girls. A 16-18 years old youth is full of optimistic aspirations, for his life and considers arts and social activity as means of enriched living. He develops the ability to channelize his emotional energy creatively and to solve problems of complex nature.

After the age of eighteen years, it is rather difficult to speak of common developmental patterns of creative abilities with age because of the great diversity in vocations chosen by individuals. Nevertheless, it is more or less established that productions of the highest quality tend to fall off at an earlier age (in the thirties) and decline slowly afterwards. In some individuals the decline is very slow even in old age, whereas others "burn" themselves out rather quickly due to various reasons.

2.3.1. GRADE-WISE DEVELOPMENT OF CREATIVE ABILITIES

On the basis of the framework provided by Torrance (1962), it can be said that there is a

steady growth of creative abilities from grade one through grade three. From thereon, there is a slump between the third and the fourth grade which is followed by a little recovery during grades five and six. Another slump occurs between the sixth and the seventh grade. After this there is again an almost steady growth until near the end of high school years. At grade eleven, there is however, again some set-back. It has also been observed that even though recovery takes place during grades five and six yet the third grade status is not again exceeded until grade nine (for boys) and grade ten (for girls). Many explanations have been given to explain the set-backs in the growth of creative abilities at the fourth, seventh and eleventh grade levels respectively. According to Torrance, these declines may be explained in terms of "...reactions to new stresses encountered at each new stage of development or each transitional state in education".

2.4. THE CREATIVE PRODUCT

According to Jackson and Messick (1965), who have dealt at length, the problems relating to the evaluation of creative

products, "no matter, what other qualities it might possess, a creative product in the first instance should be novel and universal before we are willing to call it creative". The second criterion of judging a creative product is its "appropriateness". To be appropriate, maintain Jackson and Messick, a product must fit a context. It must "make sense" in the light of the demands of the

situation and the desire of the producer. The third important criterion which applies to the evaluation of creative products concerns their capacity, to transform the 'constraints of reality' to defy tradition and yield a new perspective. Transformations are not merely improvements, they involve the creation of new forms and a radical shift in approach to a subject or in handling material. Lastly, the fourth criterion to judge the creative products is their 'condensation power'. "Products that warrant close and repeated examinations are those that do not divulge their total meaning on first viewing. They have about them, an intensity and a concentration of meaning requiring continued contemplation".

2.5. THE CREATIVE PERSONALITY

Eversince Galton's classic study of men of genius (1869), psychologists studying creativity and its different aspects have recognised the importance of studying an individual's personality as the single most important determinant of his creativity. In the words of Nicholas Berdyaev (1954), "The Creative Act is free and independent force, immanently inherent only in a person, a personality Creativity is an original act of personalities in the world".

Many theorists have, from time to time, emphasised that creativity as a variable or set of variables, cannot be isolated from the totality of an individual's personality. For eg. May (1959) maintains that "meaningful creative act occurs only when the individual makes a total commitment to some course of action". Rogers (1959) and Maslow (1954) view creativity in terms of 'self-actualization' of an individual personality. Although it would be too much to expect every body possessing potential creativity to be able to provide novel ideas of a high order, yet for the full functioning of the creative abilities of an individual, recognition of their personality concomitants is essential.

A number of research studies have been undertaken during the last two decades on the identification and the measurement of the personality concomitants of individuals and groups of individuals

considered as highly or low creative.

As early as in 1956, Bhattacharya conducted a study wherein he reported that the highly creative possessed shallow feeling for life, high sensitivity and ability for prelogical thinking. Ray Choudhary (1962, 1965 and 1966) reported that highly creatives were more distinctly marked by their emotional and temperamental traits than by cognitive and motivational aspects of their personality. They were aggressive, varied in affective life, sensitive to shift in mood tones, tolerant of frustrated experiences, and exhibit signs of intra-psychic conflict about oedipal relationship. Their achievements were found to be determined by super-ego demands and by a need to satisfy narcissistic desires. Further, they were characterised by a preference for, and tolerance for ambiguity, stimulus complexity and structural openness. Raina (1968) reported that the highly creative were characterised by greater achievement, autonomy, change and endurance. They were more dominant (Ahmed, 1969), had greater conflicts with their parents, less overtly aggressive and had a great sense of guilt.

Aaron and Malatesha (1972) found that highly creative were highly motivated, less modern or radical but more conservative. Highly creative students were characterised by high intellect, more super-ego strength, high self-sentiment formation and high energetic tension (Joshi, 1973). Lalithamma (1973) found that creativity was positively and significantly correlated with positive self-concept, intelligence and negative aesthetic self-concept. Highly creative had less need for social approval (Rehman and Hussain, 1973). Verma (1973) reported that traits of autonomy, non-conformity, and openness of mind were dominant in highly creative. They, also, possessed social boldness, high self-sentiment and high guilt proneness (Goyal 1974). According to Gakhar (1975), creative individuals possess high intellectual efficiency, more flexibility, high self-acceptance and self-sufficiency, whereas, Chawla (1976) reported that the highly creative people were more sober and more intelligent than the low creative ones. Nair (1976) reported that the creative were characterised by high self-reliance, sense of personal worth, sense of personal freedom, feeling of belongingness, freedom from with -

drawing tendencies, freedom from nervous symptoms, more social standards, more social skills, freedom from antisocial tendencies, more involvement in family relations, school relations and community relations. Rao (1976) found that ^{the highly} creative were characterised by more field independence and more integrative complexity.

Creativity was positively and significantly related with introversion (~~Chapman 1977~~ Kumar, 1981; Srivastava, 1978; Gulati, 1979 and Verma, 1980) while it was negatively related with extroversion (Nagia, 1977 and Bhargava, 1979). Psychotic and neurotic tendencies were more prominent in high creatives. They possessed high self-concept (Gupta, 1977 and Singh, 1978), less achievement motivation (Lal and Chilana, 1977).

In recent years, many investigations have been conducted wherein various non-cognitive factors like curiosity, risk-taking, conformity non-conformity, sense of humour; value orientations, extroversion introversion and neuroticism, cognitive styles, self perceptions; determination and ambition, timidity, bashfulness, motivation, independence, dogmatism, etc. have been studied in relation to creativity (Palm 1959); (Tollefson, 1961); (Hammer, 1961); (Bhattacharya, 1956, 1960, 1961); (Weisberg and Springer, 1961); (Torrance, 1959, 1961); (Gatzel and Jackson, 1962); (Stein, 1962, 1963); (Ray Chaudhri, 1962, 1963; 1965, 1966); (Hartfield, 1969); (Callister, 1970); (Mc Henry and Shouksmith, 1970); (Paramesh, 1970); (Goyal, 1969, 1972); (Lerth, 1972); (Gakhar, 1973); (Paramesh and Laxmi, 1973); (Hasan and Ali 1973); (Dutt, Bountre and Sabharwal, 1973); Mohini, 1974); (Gopal, 1975).

Kumari (1975), Singh (1975), Gupta (1976), Pandit (1976), Misra (1977), Singh (1977), Sinha and Sharma (1978), Kaur (1980), Singh (1980) and Singh (1980) studied the adjustment of individuals with ^{various} levels of creativity. Of these, Singh (1975) reported that all components of creativity were positively and significantly related with emotional adjustment; originality and elaboration were positively and significantly related with social adjustment.

Creativity was found to be positively and significantly related to adjustment in social, emotional and educational areas (Gupta 1976). The creative were found to be better adjusted (Pandit, 1976; Singh, 1977). On the other hand, Sinha and Sharma (1978) reported that the highly creative were found to be less adjusted in the home, health, and emotional areas than their counterparts, with low creativity, Kaur (1980) found that the highly creative had more problems than people with low creativity in socio-psychological areas. The creative were found to have high sense of personal freedom and higher social standards than non-creative students (Singh, 1980). Creativity was found to be positively and significantly related to the total social and educational aspects of adjustment but not to the emotional adjustment (Singh, 1980).

Gopal (1975) studied certain differentiating personality variables of creative and non-creative science and engineering students in the age range of 18 to 21 years. He reported that the creative science students were more reserved, emotionally stable, assertive, sober, expedient, venturesome, suspicious, imaginative, shrewd, experimenting, self-sufficient and relaxed. Their non-creative counterparts were comparatively more out-going, affected by feelings humble, happy go lucky, conscientious, shy, trusting, forthright, conservative, group-dependent and tense. Non creative science students possessed more organizational ability and understanding than the non-creative engineering students.

2.6. MEASUREMENT OF CREATIVITY: TOOLS DEVELOPED OUTSIDE INDIA

In the early childhood years, due to lack of communication skills among children, creativity was earlier

studied through the medium of arts. Crippen (1933), studied imagination by analyzing children's paintings. Mc Carty (1924), had used children's drawings in his study of the creative process. Several investigators also employed ink blots in their studies of imagination and creative activity (Abramson, 1927), (Andrews, 1930), Markey (1935), made use of the observational methods in standardized situations and also employed tasks like house keeping games, block

building etc. in her study of children's imagination.

However, with the development of the batteries of the tests of creativity at the college stage, attempts were also being made to adopt and modify tests to suit the high school pupils. Among the earlier well known measures, mention can be made of the contributions of (Chassell, 1916); (Borass (1922), (Hargreaves 1927); and (Welch 1946).

Other famous tests of creativity developed outside India are :

- a) Battery of Tests of Divergent Thinking developed by Guilford and his associates;
- b) Battery of Originality Tests developed by Barron;
- c) Flanagan's Test of Ingenious Solutions of Problems;
- d) Mednick's Remote Associates Tests;
- e) Battery of Creativity Tests by Getzels and Jackson;
- f) Torrance Tests of Creative Thinking;
- g) Wallack and Kogan's Tests of Creativity;
- h) Mcomisky's AG. Test.

Descriptions of these tests have been given by Freeman et al (1971). In addition to the above, mention can be made of creativity tests developed by Calvi (1965), Sparker (1960), Evans (1965), Prouse (1967), Foster (1970), Buckeye (1970), Mainvilley (1972), and Pole (1969).

2.6. MEASUREMENT OF CREATIVITY IN INDIA: INTRODUCTION

Creativity Research in India is still in its infancy; hence it is not surprising to find that not much work has been done in the direction of constructing new tests of creativity. In fact, a lack of the necessary measuring instruments has been the major reason why more empirical researches in the field of creativity in India have not been undertaken (Ray Choudhary, 1966); (Raina, 1972) and (Gupta, 1974). In the absence of the locally developed measures of creativity, Indian researchers have been forced to fall back upon the tests of creativity developed elsewhere. Many times, "...such tests have been utilised even without proper adaptation," (Goyal, 1974).

2.6. TESTS OF CREATIVITY DEVELOPED IN INDIA

Among the well known tests of creativity developed in India, mention can be made of creativity tests developed by Raina (1968), Paramesh (1971), Mehdi (1971), Passi (1971), Goyal (1974), Gupta (1975) and Gopal (1975). There is also a mention in literature about the University of Kerala Tests of Creativity~~Thinking~~, the Srijnatak Pariksha and Varnh Vipryas Pariksha, the Saijda-Zaidi's I.T.S. Test, The Test of Creative Thinking, by Chauhan and Tiwari, and Test of Scientific Creativity by Grewal and Singh. Very recently, Misra (1986) developed a test of scientific creativity for science students in Uttar Pradesh. ⁽¹⁹⁸⁸⁾ Singh developed a test of mathematical creativity also in Uttar Pradesh. A brief description of the representative tests is given below :

1. MEHDI'S VERBAL AND NON-VERBAL TESTS OF CREATIVE THINKING

The tests of Creative Thinking developed by Mehdi (1973) are designed to measure creative talent at all stages of education except pre-primary and primary. The verbal test of creativity measures fluency, flexibility and originality (v) factors and general creativity. The non-verbal test of creativity measures elaboration and originality (NV) factors of general creativity. The verbal test of creativity includes four subtests viz; (i) 'Consequences Test', (ii) 'Unusual Uses Test', (iii) 'Similarity Test', (iv) 'Product Improvement Test'. 'Consequences Test' consists of three hypothetical situations. 'Unusual Uses Test', presents the

subject with the names of three common objects. 'Similarity Test' consists of three pairs of words which apparently differ from each other, and 'Product Improvement Test' includes one simple wooden toy of a horse. The items of this test provide an opportunity for the free play of imagination and originality. The total time required for administering the test is 48 minutes.

The non-verbal test of creativity is intended to measure the individual's ability to deal with figural content in a creative manner. It includes three types of activities viz; (i) 'Picture Construction' (ii) 'Picture Completion', and (iii) 'Triangles and Ellipses'. 'Picture Construction Activity' consists of two simple geometrical figures, a semi-circle and a rhombus. 'Picture Completion Activity' consists of 10 incomplete figures and seven ellipses which are used as a base for novel drawing. The three activities, taken together, provide ample opportunity to the subject to use his imagination with different types of figural tasks. The total time required for this test is 35 minutes.

The correlations of items with their total activity scores both for the rural and urban samples are generally high ranging from .668 to .882 for verbal tests, and from .508 to .936 for the non verbal tests. Test-retest reliabilities on the total creativity score, for verbal and non-verbal tests are .959 and .946 respectively.

2.6.2. PASSI'S TESTS OF CREATIVITY (PTS)

Passi's Tests of Creativity (PTC) 1971, were standardized for higher secondary pupil population of Punjab and Union Territory of Chandigarh. The Battery consists of both the verbal and the non-verbal tests. The six tests are, (i) 'Seeing Problems Tests', (ii) 'Unusual Uses Tests', (iii) 'Consequences Test', (iv) 'Test of Inquisitiveness', (v) 'Square Puzzle Test', and (vi) 'Blocks Test of Creativity. Fifteen different types of scores for seeing problems, fluency, flexibility, originality, persistency, inquisitiveness, creativity etc. could be derived. The test-retest reliability coefficients for the six subtests

ranged between .88 to .97. The split-half reliability coefficients for the three verbal tests had a median ~~and~~ of .80. The median validity coefficients against external measures namely, Things Done On Your Own Checklist, Raven's Standard Progressive Matrices Test, Jalota's Group Test of General Ability, and Scholastic Achievement, were, .60, .27, .27 and .30 respectively; the first coefficient represents divergent validity coefficient. Factorial validity of the tests against the factors of verbal creativity and non-verbal creativity. Percentile norms for all the six subtests were also established by Passi.

2.6.3. GOYAL (1974), constructed a battery of three tests of creativity, patterned after Torrance. These are, (i) Unusual Uses Test; (ii) Common Problems Test; (iii) Consequences Test.

In the 'Unusual Uses Test', the subject is presented with the names of four common objects (a piece of stone, a wooden stick and water etc.), and he is required to write as many clever, and interesting uses as he can think of each of them. In the 'Common Problems Test', two situations are presented to the subject (entertaining the guest and doing home-work). He is asked to list, as many problems, as he can think of, within a specific time limit, related to the situations. In the 'Consequences Test', two situations are presented. (What would happen if man could fly like birds? and what would happen if your school had wheels?), and the subject is required to think of as many consequences, as he can, in each situation.

Each subtest has been designed to measure fluency, flexibility and originality. Besides, these, a composite creativity score is also obtainable. Inter-scorer reliability coefficients have been reported (.98 for fluency, .96 for flexibility, and .87 for originality respectively). The tests have also been validated against teacher's ratings. The validity coefficients reported are, .40 for fluency, .32 for flexibility, .34 for originality, and .30 for composite creativity respectively. An indirect evidence of the validity of the tests is also given in terms of the personality profiles of the pupils with high and low creativity.

2.6.4. Verma (1973) in his Doctoral Dissertation, adapted fourteen tests of divergent thinking in Hindi, for children at the high school stage. A brief account of the tests has been furnished below :

Out of the fourteen tests adapted by Verma, the 'Plot Titles Test', 'Utility Test', 'Consequences Test', 'Suffixes W-1', 'Prefixes W-2', 'Sentence Construction Test', 'Controlled Association Test', 'Number Rules Test', 'Name Grouping Test' and 'Multiple Grouping Test', were based on Guilford's research work. The 'Figure Similarity Test' and 'Similarity Test' have had their basis in Wallach and Kogan's Tests, and the 'Figure Drawing Test' and 'Circle Test' were adapted from Torrance's Tests of Creative Thinking.

2.6.5. MIER TESTS OF VERBAL AND NON-VERBAL CREATIVITY

MIER tests of creativity were constructed and standardized by Gupta (1975). Both the batteries are paper-pencil type and are in Hindi language. The tests of creativity can be administered to school going children of 12 to 19 years of age. The total time required for administration is 52 minutes for both the batteries. The tests are easy in administration and scoring, thereby making them functional in Indian school settings.

The Verbal Battery of MIER Tests included the following subjects :- (i) Hypotheses Test: In this test a situation is provided in which, the subject is encouraged to generate different hypotheses in a given time as to why smoke is coming out of

a friend's house where the subject is going for a feast.

(ii) 'Naming Creatures Test': Six figural stimuli in the form of the pictures of strange animals, birds and aquatic creatures are provided in an imaginary situation of which the subject is made a part. The subject is required to name a new, animal, bird or aquatic creature by imagining only one name for each of them, in the given time. (iii) 'Coded Letter Test' : A situation is provided of which the subject is made a part. The subject is required to convey in the given time, a given statement in the form of a coded letter (cryptogram) to the police, so that, the thieves attempting to stage a theft may be foiled in time.

(iv) 'Explorations Test' : In this item, the situation of a shipwreck is provided and the subject is asked to imagine himself ~~and~~ an isolated Island. He is required to give details of the different activities he would engage in, on that Island.

(v) 'Medicine Component Test' : In this test, a scientific situation is provided. The subject is supposed to be the inventor of a very useful medicine for which an imaginary (nonsense) name is provided. He/she is expected to write the names of the different things, substances or the materials, with the help of which the new medicine can be prepared/manufactured. (vi) 'Medicine Process Test' : In this subtest, the situation given the Medicine Components Test is repeated and the subject is required to write the different methods/processes supposedly employed by him in the preparation/manufacture of the imaginary medicine.

The Non-verbal Battery of MIER's Tests of creativity includes the following 5 subtests : (i) 'Medicine Plant Test' : In this subtest, a scientific situation is provided in which the subject is supposed to be the inventor of a very useful medicine (to which an imaginary nonsense name is provided). He is then asked to draw an outline or sketch of the apparatus or machine, using which the medicine can be prepared/manufactured. For drawing the sketch, a fixed space is provided. (ii) 'Chair Completion Test' : In this subtest, an incomplete sketch of a chair (Having been left incomplete by some carpenter) is presented to the

subject under a situation, and he is asked to complete and beautify the above sketch making additions, elaborations or modifications wherever desired. (iii) 'Car Designing Test' : In this subtest, a situation is provided in which the subject is asked to give the sketch/outline/drawing of a car which he can use to travel to the different countries with one of his friends. This car is further supposed to fulfill certain pre-determined conditions (strength, safety etc.). (iv) 'Figure Construction Test' : In this subtest, three geometrical shapes (a circle, a square and a triangle) are provided. Using 12 of these figures, the subject is asked to construct a human figure. At least one geometrical shape of all types must be utilised by him in drawing the human figure, in the given time. (v) 'Bricks Drawing Test' : In this subtest, the subject is asked to use bricks in making as many pictures/outlines/sketches of the things and the objects as he can (and identify each sketch) from a large number of bricks provided to him.

The test-retest and inter-scorer and intra-scorer reliability coefficients (Subtest-Wise), on the Battery of Verbal and Non-verbal Creativity Tests range from +0.282 to +0.715 ; +0.844 to +1.000 ; and +0.983 to +1.000 respectively. Content validity, Concurrent validity, Factorial validity and Construct validity of the MIER Tests of Creativity both verbal and non-verbal was also reported by Gupta. Thus the MIER Tests of Creativity show incidence of high reliability and validity.

2.6.6. BATTERY OF TESTS OF SCIENTIFIC CREATIVITY BY MISRA (1986)

Misra (1986) constructed a battery of tests of scientific creativity to be administered on boys and girls studying in eight intermediate colleges in Agra, Mainpuri, Farrukhabad and Kanpur districts. The battery consists, in its final format of six tests viz :

- i) 'Consequences Test' (CT) ; Containing the items viz; (a) If legs of all honey bees of India are broken. (b) If there exists no carbon-dioxide gas in the environment of earth. (c) If horses start

living on trees (d) If lions become immortal. (e) If wings are transplanted to the human body.

- ii) 'Unusual Uses Test';
(UUT) Containing the items viz; (a) Beaker (b) Wax (c) Water (d) Needle
- iii) 'Product Improvement Test' (PIT) Containing the items viz; (a) Model showing Reflex Action (b) Model of Parrot.
- iv) 'Inquisitiveness Test';
(IT) Containing the items namely, a) two experimental settings (designed by Misra 1979) to demonstrate discovery learning. (b) An abnormal mammal with a face like a man.
- v) 'Guess Causes Test' ;
(GCT) Containing items viz ; (a) Reasons for the external structures as visible in the abnormal man (b) What will be the causes for the survival of the abnormal man, when he does not die even after inhaling a capsule containing a mixture of poisonous substances like Copper Sulphate, Acid and Arsenic etc ? and lastly,
- vi) 'Block Design' Test' (BDT)

The parallel form reliabilities for the 'Unusual Uses Test', 'Product Improvement Test', and 'Inquisitiveness Test' are .53, .79 and .54 respectively. The split half reliabilities for the 'Consequences Test', 'Unusual Uses Test', and 'Guess Causes Test' are .57, .63, and .50 respectively. The validity coefficients

for the Tests of Scientific Creativity (TSC) obtained after utilising Teacher's and Peer Nominations are .69 (CT), .82 (UUT) .80 (PIT), .60 (IT), .71 (GCT) and .64 (BDT) respectively.

2.6.7. BHOODEV SINGH'S TEST OF MATHEMATICAL CREATIVITY

Bhoodev Singh developed a test (1988) to identify mathematical talents at middle class stage

(11 + to 13 + years). In this test, the situations provide a chance to students to think and utilise their mathematical talents to the maximum possible extent, and encourage the subjects to deal freely with numbers. The tasks pertaining to fluency, flexibility originality (verbal and non-verbal) and elaboration have been used in the construction of the mathematical creativity test.

The test consists of two verbal items viz : (i) 'Pattern In Mathematics' and (ii) 'New Relationships; and one non-verbal item viz; 'Incomplete Mathematical figures'. A brief description is given below :

'Patterns In Mathematics' activity consists of three items and requires the subject to find out different, novel, valuable and unrepeatable patterns in mathematics e.g. Make 1 to 5 numbers by using four-sevens at a time. The subjects are instructed to search out the different patterns and write them along with the solutions in the space provided below the item, in a time span of twenty minutes. In the 'New Relationships' activity, the subjects are required to discover new relationships by putting new values to the alphabets.

e.g. $\begin{array}{cc} \text{H} & \text{A} \\ + \text{A} & \text{A} \\ \hline \text{H} & \text{A} & \text{A} \end{array}$

This activity gives information on how a subject can establish relationships by assigning different and original values of alphabets in a time span of twenty minutes.

In the Non-Verbal Mathematical Creativity Test, three items of incomplete mathematical figures are given. The subjects are instructed to make more complex mathematical figures as the one given as base.eg. Some dots are given below. Make different mathematical figures by joining the dots. Try to make figures which you think no one else would imagine. Name the figure.

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The correlations between the verbal and non-verbal mathematical scores are 0.501 and 0.534 for rural and urban samples respectively. The reliability values, on all the factor scores on verbal, non-verbal and total mathematical creativity tests, are considerably high, ranging from 0.4631 to 0.8408.

2.7. INDIAN TESTS OF CREATIVITY : CONCLUSIONS

An analysis of the different measures of creativity developed in India reveal that ;

- a) Almost all the tests of creativity, yield scores invariably, in terms of one or a few other dimensions of creativity. This suggests that the measurement of creativity is limited to merely a few conventional dimensions.
- b) Most of the existing instruments for measuring creativity seem to be heavily loaded with verbal ability. As such, they may not do full justice to individuals with low verbal facility (Pole, 1969), (Nuttall, 1971).
- c) Most of the tests of creativity in India are general tests. There are not many tests available, for measuring scientific, entrepreneurial and mathematical creativity particularly at the +2 stage in education.
- d) There is a general lack of the figural or the non-verbal tests of creativity - ostensibly because their scoring is notorious for cumbersomeness and subjectivity.
- e) In most of the Indian tests, scoring schemes have not been systematically prepared; are not very objective and are based on responses gathered on small samples (Passi, 1971), (Goyal, 1973), (Verma, 1973).

Thus it can be concluded that, there is a general lack of original, unique, reliable, objective and valid measures of creativity in India especially for the measurement of creativity in scientific, mathematical, entrepreneurial and specific fields.

2.8. SURVEY OF RELATED STUDIES: A Large number of studies, at the institutional, Master's and Doctoral levels, have been conducted in the domain of creativity. The details of these studies are available in different research journals, master and Ph.D. dissertations and in the First, Second and Third Survey of Research in Education (Buch, 1974, 1979, 1986). Excellent reviews of these studies have also been made by Raina (1971, 1974, 1980), Gupta (1974, 1980), Passi (1982), Misra (1986), and Singh (1988).

An effort has been made in the following paragraphs to review researches conducted in the area of creativity with special reference to the Indian studies, with a view to highlighting the relationship of creativity with the selected key variables taken up in the present investigation.

2.8.1. SEX AND CREATIVITY Passi (1971), Bedi (1974), Gupta (1974), Singh (1975), Rawat and Garg (1977), Arora (1978) and Jarial (1981) found that female students were significantly superior to the males on verbal creativity. They were also significantly superior on non-verbal creativity as reported by Bedi (1974) and Jarial (1981). Hussain (1974) and Pandit (1976) reported that the females were significantly superior to the males on fluency, flexibility and originality dimensions of creativity. Raina and Goyal (1971, 73) found females to be significantly superior to males only on fluency and flexibility dimensions of creativity.

Male students were found to be significantly superior to their female counterparts on verbal creativity, (Prakash, 1966; Gagneja, 1972; Jain, 1975; Rawat and Agrawal, 1977, Badrinath and Satyanarayan, 1979; and Sharma, 1979); on non-verbal creativity (Passi, 1971); on originality, (Raina, 1971; Dhir, 1973;

Awasthy, 1979; and Badrinath and Satyanarayan, 1979]; on fluency, (Awasthy, 1979; and Jarial and Sharma, 1981) on fluency and originality (Pandey, 1980); and on elaboration (Singh, 1978).

Mishra (1985), recently reported that the males were superior to their female counterparts on scientific creativity.

No significant differences were found between male and female students with respect to verbal creativity (Rains, 1970; Gakhar, 1974; Thammapruteep, 1976; Dutt et. al; 1977; Lal, 1977; Singh, 1977; Thorat, 1977; Singh, 1978; Gupta, 1979; Masih, 1979; and Pandey, 1980).

Very recently, Passi (1982), Jose (1987) and Pillai (1988) established in their studies, that sex is a probable determinant of creative performance.

2.8.2. ACADEMIC SUBJECTS AND CREATIVITY

Some studies aimed at finding out whether or not the students from academic subjects/streams (viz. science, arts, home science and commerce) differ among themselves with respect to creativity. Srivastava and Jha (1977) and Srivastave (1978) reported the science students to be superior to the students in arts and commerce. Superiority of science students over arts students on fluency and flexibility components of creativity was reported by Awasthy (1979). The superiority of science students over the arts students on non-verbal creativity was reported by Jarial (1981). Kann (1980) observed that commerce students were significantly superior to science and home science students on verbal creativity.

Shukla, (1982); and Misra, (1985) reported that science students were significantly superior to their counterparts in other streams, on creativity.

No significant differences on verbal creativity were found between the groups of arts and science students (Rawat and Garg, 1977), between arts and commerce students (Srivastava and Jha 1977) and between science and commerce students (Sansanwal and Jarial, 1979).

2.8.3. INTELLIGENCE AND CREATIVITY The relationship between creativity and intelligence has always remained a point of interest among the Indian investigators. Hence many studies have been conducted wherein intelligence was measured by using tests namely Raven's, Standard Progressive Matrices, Jenkin's Non-Verbal Group Test of Intelligence, Mohsins's Group General Test of Intelligence, Jalota's Group Test of General Mental Ability, Joshi's Non-Verbal Test of Intelligence, Prayag Mehta's Test of Verbal Intelligence, Phatak's Draw-a-man Scale, Madhookar Patel's Intelligence Test, Saxena's Test of General Intelligence and Desai Bhatt's Group Test of Intelligence.

Even before the emergence of the concept of IQ however, studies reported that the performance of some persons of intellectual type and with great logical power was poor on indices of imagination and intellectual spontaneity. Mcloy and Meler (1951) have reported low correlation between IQ and tests of originality and imagination. Guilford (1950) has also raised doubts about the possibility of high relationship between creativity and intelligence. He deepened the controversy when he stated that, to fathom creativity, we must look beyond the bounds of intelligence. Wallach and Kogan (1965) may be credited with having demonstrated clearly the distinction between the domains of creativity and intelligence. They found that the average correlations between these two traits was 0.1. Their results confirmed that the dimension of creativity exists almost independently of intelligence.

However, a majority of Indian studies have reported a positive and significant relationship between intelligence and creativity (Phatak, 1961, 1962; Raina, 1968; Trivedi, 1969; Passi, 1971; Sharma, 1971; Sharma, 1972, 1974; Azmi, 1974; Bedi, 1974; Goyal, 1974; Joshi, 1974; Kumari, 1975; Dhaliwal and Saini, 1976; Dutt et al., 1977; Gakher and Kaura, 1977. Singh, Mathur and Saxena, 1977; Singh, 1978; Patel and Joshi, 1978, Badrinath and Satyanagayan, 1979; Gulati, 1979; Gupta, 1979;

Jarial, 1979; Sandhu, 1979; Jarial and Sharma, 1980; Gakhar et.al. 1980; Chadha and Sen, 1981; Maddu, (1981) and Mishra (1984); and Gupta (1982).

Insignificant creativity - intelligence relationship was reported by Gupta (1982).

Gulati (1982) and Gupta and Sharma (1982) reported a lack of relationship between the domains of creativity and intelligence.

That creative training starts interacting significantly at above average level of intelligence but fails to show such stimulating effect with low intelligence groups was reported by Gakhar (1984).

2.8.4. SCHOLASTIC ACHIEVEMENT AND CREATIVITY

The relationship between scholastic achievement and creativity was studied by many Indian researchers. In these studies, the achievement of students in the annual examination, was considered as an index of their scholastic achievement. Mention can be made of studies by Raina (1968), Trivedi (1979), Khire (1971), Lalithamma (1973), Bagga (1973), Bedi (1974), Jain (1975), Pandit (1976), Mehdi (1977), Singh, Mathur and Saxena (1977), Singh (1978), Awasthy (1979), D'Lima (1979) Gupta (1979), Masih (1979), Sandhu (1979), Asha (1980), Vijay Lakshmi (1980) and Jarial (1981), which reported a moderate positive and significant relationship between scholastic achievement and creativity.

2.8.5. ENVIRONMENTAL FACTORS IN CREATIVITY : INTRODUCTION

Creativity does not blossom in a vacuum. The creative mind interacts vigorously with a nexus of supportive and stimulating factors in the environment - whether at home or at school - to be worth its name (Weisberg and Springer 1961).

2.8.5.(a) HOME ENVIRONMENT AND CREATIVITY

Among basal factors in the home environment, birth order and family size play important roles in the development of creativity (Mackinnon 1960; Cicirelli, 1971). The chances of the first born child to be creative are rated high (Roe, 1963; Cattell and Brimhal, 1921). However, researches by Schaefer (1963) and Datta (1967) do not support this view. Sibling relations, serious illness and relative isolation resulting therefrom during childhood, unbroken homes where death, divorce or hardships are absent, have also been shown to affect creativity growth (Mc Clelland, 1963; Oden, 1968). Parent child relationship, over-protectiveness on the part of the parents, respect in the family for autonomy and non-conformity, a respect for his individuality and ability, parental tolerance and self-control are other factors in the home environment which influence the growth of creative abilities (Mackinnon, 1960-62; Drevdahl 1964; Nicholas and Holland, 1964, Wyer, 1967; Spots and Mackler, 1967; Schaefer and Anastasi, 1968, Evans, 1971).

Mc Curdy (1957) and Greenacre (1958) Demonstrated that historic geniuses had intensive, generally warm relations with parents. Walberg (1971) obtained data from 3000 adolescents on self-reported creativity biographical variables and IQ, and found that adolescent creativity is associated with stimulating home environment. A positive home environment is conducive to better creative development was reported by (Shmukler, 1982-83; Fu, M. Sawyers, Milgram (1983).

Weisberg and Springer (1961); Getzels and Jackson (1961); Hudson (1966); Devesta and Thompson (1970); Langden et.al. (1981); Misra (1983); (1984); Singh (1985); Sumangala (1988), reported that differences between convergent and divergent thinkers are due to early experiences in the environment and that familial factors like good interpersonal relationships between parents and children foster the development of creativity.

2.8.5.(b) SCHOOL ENVIRONMENT AND CREATIVITY

Among the institutional environment factors affecting creative abilities, the role of classroom interaction between teacher and the pupils is very important. The

school environment is so vast that researchers have invariably faced peculiar difficulties in assessing precisely what is in a classroom or in the school which can influence creativity of a child (Govatana, 1977). Results of Morrow's study (1984) reaffirmed the importance of teacher's role in establishing a classroom atmosphere conducive to growth in student creativity. Teacher's question asking behaviour seems to have a direct bearing on creativity (Burkhart, 1962; Torrance and Hansen, 1965; and Flanders, 1970). Disagreements, arguments, debates . . . diverse information and ideas are all important aspects of gaining creative insight. Such interpersonal interactions increase the number and quality of ideas, feelings of stimulation and enjoyment and originality of expression in creative problem solving (Bahn, 1964; Dunnette, Campbell, and Jaastad, 1963; Triandis, Bass, Ewen, and Mikesele, 1963; Bolen and Torrance, 1966).

Torrance's studies of development patterns throughout the elementary grades have made him especially alert to the damping effect of the school system upon creativity. Torrance (1960) concluded that after the second grade stage in schools creativity is squelched by demands for conformity.

(Raina, 1971); (Goyal 1971); (Reudi, 1974); (Gupta, 1978); (Jarial and Sharma, 1980); (Schemppet et al, 1983); (Butler-Arolosoroff, 1982); (Schechter, 1983); (Ahmad, 1983); (Hertz and Denmark, 1983); (Morrow, 1984); (Guili and Delli Santi, 1983); Gaines, 1983); reported that a positive ^{and democratic} school environment is conducive to creative development.

2.8.6. CREATIVITY AND SELF-CONCEPT

The creative process has been one of the most difficult areas for behaviouristic psychology to handle. The answer that creativity is the combination of existing stimulus-response bonds, fails to deal adequately with discovery, imagination and problem solving, which are important for explaining the emergence of a product from within the individual. According to Wiggins, Renner, Clore and Rose (1971), "Creativity is philosophically compatible with self-theory, which accepts

freedom for action as characteristic of human personality."

Maslow (1954), has also described "creativeness" as a universal characteristic of his group of self-actualizing people. The relationship between creativity and self-concept, ideal-real self-discrepancy self-acceptance and self-actualization, becomes obvious when we find that Maslow's descriptions of the self-actualizing persons are very similar to those described as the characteristics of creative persons (Nash, 1970).

Thus, self-actualising and creative persons are self-accepting, spontaneous, constructively unconventional, autonomous, having internal locus of control, capacity to appreciate the basic things of life, democratic, and have a developed non-hostile sense of humour.

Gupta (1974) studied creativity and its relationship with self-concept among adolescents at the +2 stage in education and concluded that; (a) The growth patterns for the different creative abilities and for the different aspects of self-concept, show definite developmental trends in relation to age, grade and sex. (b) Significant differences exists between the highly creative and the less creative pupils on the bases of the levels of their self-concepts. (c) Significant differences exist between the pupils with high and low self-concepts, on the bases of their patterns of verbal and non-verbal creative abilities.

2.8.7. LOCUS OF CONTROL The concept of locus of control has been studied by researchers. Mention can be made of studies by Du Cette and Wolk, 1972, Lawrence and Winschel, 1975, Kurtz and Neisworth, 1976).

The value of development of internality, among individuals for self-enhancement, self-control and better learning, was researched by (Mc Ghee and Grandnall, 1968, Joe, 1971, Shipe 1971, Nowicki and Walker, 1973, Dweck and Repppercei, 1973, Stevens and Belys, 1973, Gozal et al. 1973, Daniels and Stevens, 1976).

Influence of variables namely locus of control, socio-economic status, intelligence and types of schools in relations

with the perceived self-concept at the adolescent stage was studied by (Lebo, 1956, Perkins 1958, Kaur 1967, Burke 1969, Sharma 1970, Ram Kumar 1970, Epstein and Kamorita 1971, Fox 1972, Sinha 1972, 1974, Mohini 1974, Gupta 1977 and Gupta and Sharma 1980).

Verma (1980), studied locus of control of high and low creative school students, at different levels of socio-economic status using the Hindi version of Rotter's I-E Scale (1969) adapted by Aggarwal. The results indicated that the students who were highly creative had internal locus of control.

2.8.8. VOCATIONAL PREFERENCES AND CREATIVITY

Among a host of factors in the environment which trigger what Rosenberg (1957) terms a series of progressive delimitations of alternatives, the part played by the status or prestige value of vocations in diminishing or heightening the images of vocations in the eyes of the one contemplating them, as possible choices is recognized by research Krishnan (1956), Gures (1956), Rosenberg (1957), Sharma (1958), Pandey (1963), Hilton et al. (1970). The status value of vocations is perhaps the single most important factor influencing children and parents alike in choosing vocations for the former (Sinha and Dash, 1959), Cook (1962), ^{Chopra (1982)} Singh and Prasad, Rezler (1963).

Paramesh and Narayanan (1974) compared the vocational interests of high and low creative college students. Their results showed that the highly creative were significantly higher than their low creative counterparts, with respect to their interest in persuasive, linguistic, artistic and musical interest areas.

Parlikar (1973) studied vocational maturity of high school students and reported among other findings that intelligence and academic achievement was associated with overall vocational maturity.

Bhan (1973) studied the relationship between creative potential and level of aspiration and found that the level of aspiration in case of highly creative group was high and was found to be within the productive resources of the individual.

Bisht (1972) observed a positive relationship between academic achievement and level of educational and occupational aspiration. Phutela (1976) found that academic achievement was positively related to educational and vocational aspirations; and to the level of aspiration as such (Sharma 1978).

Gupta (1974), studied vocational development among 11+ pupils and threw important light on the relationship between status valued of professions, vocational preferences and age, in conformity with the work of Dysinger (1950), Miller and Form (1951) and Super and associates (1957).

Components of fluency, intelligence and socio-economic status, as correlates of interests in agricultural pursuits was studied by Bharadwaj (1981), who reported that general fluency promotes agricultural interest in students of poor socio-economic status, and tends to promote or demote interest in scientific pursuits.

Singh and Mehra (1981) compared the educational and career aspiration levels of adolescents with high and low creativity. They reported that the highly creative preferred unconventional occupations as that of air hostess, lawyers, and scientists whereas their counterparts with low creativity preferred conventional occupations as teaching.

Taneja (1984) studied vocational interests of high school children in Chandigarh and reported that, the vocational interests of children are very unrealistic; revealing a lack of personal characteristics and basic information of vocational avenues. No marked variation exists in the vocational interests of boys and girls and the professions of teaching, medicine, artist careers are preferred more by girls. Occupational aspirations of Higher Secondary Students were studied by Sundararajan and Rajasekar (1978).

Thus, on the basis of the review of related research, it can be concluded that the number of researches on the vocational preferences of the adolescents endowed with different types of creativity is negligibly small. Further, the studies, conducted several years ago are not comparable to enable one to generalize something concrete in the above direction.

2.8.9. STUDY HABITS AND CREATIVITY

In a number of studies conducted in India, the investigators have compared the study habits of different groups of learners, divided into several sub-groups, on different criteria and researches have generally revolved around the analysis or comparison of study habits of high or successful achievers or highly intelligent learners and of learners with different backgrounds variables.

Maximum number of studies however, concern the relationship of study habits, with academic achievement. Patwardhan (1978) in his article on, "How to Study", crystallized the following factors involved in effective study habits viz;
(a) Motivation (b) Fast Reading (c) Vocabulary (d) Schedule (e) Place of Study (f) Survey (g) Questions (h) Reading (i) Recitation (j) Review (k) Taking Notes on Reading and Lectures and using them.

Very recently, thirteen studies, were reviewed in the area of academic achievement and study habits by Sansanwal, Jarial and Buddhisagar (1986). Out of these, twelve studies, had been carried out with subjects from grades VIII to XI (Lohitnaksham, 1961; Mathur, 1963; Rao, 1965. Lulla, Shah and Daxji, 1966; Srivastava, 1967; Jha, 1970; Bhaduri, 1971; Dhaliwal, 1971; Pathak, 1972; Kulwant Kaur, 1974; Lalithamma, 1975 and Seetha, 1975), while one study (Sharma, 1978), was carried out with students from undergraduate level. All these studies, have reported a positive and significant relationship between academic achievement and study habits.

Since creativity has traditionally been notorious for showing low association with academic achievement, no wonder there exist, very few research efforts wherein, learning strategies on study habits of the creative adolescents should have been studied.

Before the current interest in the study of different kinds of creativity which also include individuals with high creativity, the study habits of "gifted" under achievers were investigated.

For example, Lum (1960), compared under and over-achievers of similar aptitudes and concluded that, the difference between successful and less successful students, was one of attitude and motivation rather than of reported study habits.

In summarizing the characteristics of gifted under achievers, De Hann and Havighurst (1961) have mentioned that, "Their study habits are not as good as those of achievers".

A review of several research studies on the subject of over and under achievers indicates that, in terms of learning habit patterns, the over achiever typically ; studies more regularly at the same time and places; goes to work with less procrastination; spends considerably more time in study; concentrates more and yields less to distractions; has better school attendance (Gupta, 1969).

In the light of the above review, it can be seen that, upto date information is not available on the study habits of adolescents with high creativity in general and of adolescents at the +2 stage of education, who are creative in the different fields like science, mathematics and commerce.

2.8.10. SURVEY OF RELATED STUDIES : CONCLUSIONS

On the basis of the review of the related studies, the following conclusions can be crystallized,

which highlight the need to undertake the present investigation :

1. The area of entrepreneurial creativity has received scant attention in both Indian and Foreign researches. The concept of entrepreneurial creativity, creative thinking in the field of commerce and characteristics of creative entrepreneurs have largely remained unexplored areas. Similarly, very few investigations have been carried out on adolescents endowed with scientific and mathematical creativity.
2. Most studies in the area of creativity have focussed their attention on pupils studying at the middle and high school stages and at the college level. Creativity at the +2 level of education, which is a major cut off point (NPE, 1986) for vocational purposes,

has hardly been studied, by researchers. There is therefore, much scope for undertaking more research studies at this stage which has received maximum attention in the National Policy on Education.

3. Eventhough some exploratory attempts have recently been made, in the fields of scientific creativity (Gopal, 1975, Misra, 1987), and mathematical creativity (Singh, 1988), majority of research studies in the field of creativity, have been confined to the domain of general creativity. Consequently, there is a paucity of attempts to study individuals endowed with creativity in specific fields, and draw the line of demarcation between the individuals endowed with the scientific, mathematical and entrepreneurial creativity.

4) Few research investigators in India have studied the interpersonal relationships with parents, teachers, siblings and friends, of adolescents with high and low creativity levels in science, mathematics and commerce streams. Similarly, not much attention seems to have been given, to studying and comparing the learning^{study} strategies of adolescents, with high and low creativity in the different fields viz; scientific, mathematical, entrepreneurial etc. Among other variables on which more research is needed, mention can be made of locus of control (Aggarwal, 1969; Verma, 1977. Gupta and Sharma, 1980); Perceived Self-images of individual's endowed with different types of creativity (Gupta 1975), to name a few. Also, relatively little is known about the differences in the patterns of vocational preferences of adolescents endowed with high and low creativity in scientific, mathematical and entrepreneurial fields as whatever little we know about the vocational preference of creative adolescents it is on the basis of identifications made with the help of general tests of creativity, It would surely be interesting from the research point of view, to study the inter-group differences on these variables using new batteries of tests of creativity.

It can thus, be concluded that the present study happens to be a significant one as we expect to throw light on some important hitherto relatively unexplored variables vis-a-vis creativity in different fields. It is timely, pertinent and needed from the points of view of education and research in general.

CHAPTER THREE

METHODOLOGY AND DESIGN OF THE STUDY

3.1. METHOD
OF STUDY

The method adopted in the present investigation can be described as being "descriptive statistical" in nature. The use of inferential statistics has also been made in deducing results from the different statistical techniques employed for delineating and comparing profiles of the talented adolescents and for finding answers to the different questions raised in the study.

3.2. DESIGN OF
THE STUDY

The present investigation was conducted in eight phases. The First Phase was concerned with a survey of related literature and with the construction of the preliminary drafts of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity, Interpersonal, Relations Inventory, and the Study Habits Questionnaire. A Pilot run was given to the newly developed tests and workable items were retained after analysing the responses to the different tests. In the Second Phase, the revised tests were administered to the respondents at the +2 stage in the science, mathematics and commerce streams. The responses elicited there from were utilised for developing scoring schemes for the new tests. In the Third Phase, item-analysis, reliability and validity studies were carried out on the newly developed tests to obtain the final forms of the tests. Phase Four was concerned with the administration of the finalised drafts of the new tests of scientific, mathematical, entrepreneurial creativity and the pre-standardized battery of tests of verbal and non-verbal creativity on a sample of 2400 adolescents studying at the +2 level in the science, mathematics, commerce and arts streams. The Fifth Phase was concerned with the scoring of the responses of 2400 students in accordance with the scoring schemes prepared in Phase Two. In the Sixth Phase, the main objective was to obtain the psycho-social and academic profiles of

those adolescents who had been identified as "high" and "low" on scientific, mathematical, entrepreneurial, and general/overall creativity. To this effect, the tests Things Done On Your Own Checklist, Test of General Mental Ability, Rotter's I-E Scale, Interpersonal Relations Inventory, Study Habits Questionnaire, Vocational Preference Checklist and Personality Word List, were administered on a sample of 960 adolescents at the +2 level in the four streams viz ; Science, Mathematics, Commerce and General/arts. This phase was also concerned with scoring of the responses elicited on the various tests. In the Seventh Phase, masterlists were prepared for computer processing. Conclusions were drawn. The last Eighth Phase was concerned with report writing, typing and editing. The procedure at each phase has been described in the following pages :

3.2.1. PHASE 1 At this stage, the main objective of the investigator was to select different types of items for the proposed Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity as also for the Interpersonal Relations Inventory and Study Habits Questionnaire. An extensive perusal of related literature on the subject of creativity and the other variables taken up for study was made. A series of discussions with experts and educationists were held. The areas to be explored through the questionnaires/inventories/tests in the investigation were concretized. Thereafter, preliminary drafts of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity on one hand, and Interpersonal Relations Inventory and the Study Habits Questionnaire on the other, were constructed. Initial drafts consisted of twelve items in the field of scientific, nine in the field of mathematical and twelve in the field of entrepreneurial creativity. Similarly, one hundred and seventy five items for the Study Habits Questionnaire and one hundred and forty items for the Interpersonal Relations Inventory were prepared. In order to test the practicability and suitability of the items, the batteries of tests of creativity were given a pilot run on a sample of 100 adolescents studying in the higher secondary (previous and final) classes. Likewise, the preliminary drafts of the

Interpersonal Relations Inventory and Study Habits Questionnaire were administered to the same sample of 100 adolescents in the science, mathematics, commerce and general streams. On the basis of the responses elicited, the format and language used in the test items were modified suitably. Some items which did not work well were deleted and the test versions were refined. In this way, the revised drafts of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity the Interpersonal Relations Inventory and the Study Habits Questionnaire were obtained.

3.2.2. PHASE II The revised batteries of tests of creativity (scientific, mathematical and entrepreneurial), and the Interpersonal Relations Inventory and Study Habits Questionnaire were, at this stage, administered on a random sample of 250 adolescents at the +2 stage in the science, mathematics and commerce streams. In the light of the responses to the items, the instructions and language for a few items were modified and made unambiguous. The responses were further analysed and scoring keys were developed for the different tests. For the batteries of tests of creativity, scoring procedures were drawn to derive scores on both conventional and new dimensions of creativity like fluency, flexibility, originality, elaboration, novelty, inventiveness, transformation and productive designing/^{ability}. Weightages were assigned to different response categories in terms of desirability, undesirability of responses on Interpersonal Relations Inventory and Study Habits Questionnaire respectively.

3.2.3. PHASE III The main objectives of the investigators during this phase were :

a) To perform item-analysis on the newly developed Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity.

b) To make necessary changes in the test items in the light of the results from item-analysis and, thus, to finalise the forms of the proposed batteries of creativity tests.

c) To establish the reliability and validity of the Batteries of Tests of Creativity (scientific, mathematical and entrepreneurial and to conduct reliability, validity studies on the Inter-personal Relations Inventory and the Study Habits Questionnaire. For item analysis, a sample of 1110 adolescent studying in the Higher Secondary Previous and Final classes in arts, science and commerce streams was selected out of which 370 responses in each category were scored with the help of the scoring schemes prepared for the purpose. The purpose of item-analysis was to know in statistical parlance, how well scores on a particular subtest differentiated between the two extreme groups (top twenty seven and bottom twenty seven percent). On the basis of item-analysis, items which had shown poor discrimination between the upper (top) and lower (bottom) groups, were deleted. Thus, the final forms of the Batteries of Tests of Creativity were obtained. Further details regarding item-analysis have been furnished in Chapter Four.

3.2.3. RELIABILITY AND VALIDITY STUDIES

When the final forms of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity and the Study Habits Questionnaire and Inter-Personal Relations Inventory were ready, the next step was to establish the reliability and validity of the new tests. To that purpose, a representative sample of 150 students was selected. The nature of the items in the newly developed tests of creativity limited the reliability studies on the proposed tests to the following three types :

- i) Test-Retest Reliability ✓
- ii) Intra-Scorer Reliability ✓
- iii) Inter-Scorer Reliability ✓

A detailed account of the reliability studies conducted, and results thereof have been furnished in Chapter Four.

For establishing validity, it was decided to establish the content, construct and concurrent validity of the newly developed tests. For this purpose the following external criteria were utilised :

- a) Torrance's Things Done On Your Own Checklist (Abridged)
- b) Academic Achievement (Scores Converted into percentages)
- c) MIER Tests of Creativity (Verbal and Non-verbal)
- d) Intelligence .

Details of validity studies. and results there of have been reported in Chapter Four.

3.2.4. PHASE IV After the construction and standardization of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity, the investigators proceeded to administer the tests of scientific, mathematical, entrepreneurial and general creativity with a view to identifying adolescents with high creativity in the four areas. For this purpose a sample of 2400 adolescents studying at the +2 stage, in the science, mathematics, commerce and arts/general streams was selected. This phase being an important one, care was taken to create a conducive environment in the various local higher secondary schools with the cooperation of the concerned faculty members. Preprinted instructions were read aloud, and difficulties in language if any, were removed. Specially prepared response sheets were supplied and the respondents were requested to give original, unusual, novel and new responses to the items in the creativity tests. Thus using the batteries of tests of creativity data was collected.

3.2.5. PHASE V

During this phase, the investigators were solely occupied with the scoring of the responses on the batteries of tests of creativity. Response sheets of 600 adolescents in scientific creativity, 600 in mathematical, 600 in entrepreneurial and 600 in overall/general creativity were scored utilizing the prepared scoring keys. Thereafter, the students high in the four areas of creativity and low in the four areas of creativity, were identified in order to obtain their psycho-social and academic profiles. This was done by working out P₂₇ and P₇₃ percentile scores. Sets of identifications yielded by different tests of creativity were compared to know the extent of similarity of identifications vis-à-vis tests of general creativity.

3.2.6. PHASE VI

This phase involved administering of all the remaining tests selected for the investigation on a sample of 960 adolescents at the +2 stage in the four areas of creativity viz ; Scientific, Mathematical, Entrepreneurial and General. A sample of 240 students each in the science, mathematics, commerce and general streams were administered the following tests :

- a) The Group Test of General Mental Ability ✓
- b) Things Done On Your Own Checklist ✓
- c) The Interpersonal Relations Inventory ✓
- d) The Study Habits Questionnaire ✓
- e) Rotter's I-E Scale ✓
- f) The Vocational Preference Checklist ✓
- g) The Personality Word List ✓

As in the earlier phase, a conducive environment for the administration of the tests was provided in the various higher secondary schools. Instructions were read aloud and explained in clear and unambiguous language where needed. The respondents were asked to give frank, honest and true responses to the various items in the tests. Testing was conducted in three sessions of about two hours each day. Thus, the psycho-social and academic profiles of the

adolescents identified as "high" and "low" on the Batteries of Tests of Scientific, Mathematical, Entrepreneurial and General Creativity were obtained.

The responses on the various tests administered were also scored with the help of the scoring schemes available.

3.2.7. PHASE VII

During this phase, the investigators were occupied with the preparation of master lists for data processing. Data was computerized and results were obtained. These were interpreted and conclusions were drawn. Multiple Regression Analysis technique was employed to derive regression equations for predicting scientific, entrepreneurial, mathematical and general creativity.

3.2.8. PHASE VIII

This last phase was concerned with report writing and typing. Two drafts were prepared. These were edited and the final draft was prepared.

3.3. SAMPLE

The sample for the present study was selected keeping in view the needs, objectives and aims of the study in different phases. The distribution of the sample has been given in the following tables :

TABLE - 3.1

SAMPLE DISTRIBUTION AT DIFFERENT STAGES OF THE INVESTIGATION

STAGE	SAMPLE
Initial Try Out	100
Scoring Schemes ✓	250
Item Analysis ✓	1110
Reliability and Validity Studies ✓	400 ✓
Identification of Talented Children	2400 ✓
Profile Analysis and Regression	960 ✓
Grand Total	5220

TABLE - 3.2.
SCHOOL WISE SAMPLE COMPOSITION
STREAMS AND SAMPLE

SCHOOL	SCIENTIFIC	MATHEMATICAL	ENTREPRENEURIAL	OVERALL	TOTAL
Diwan Badri-nath.	P.U.C. 60 T.D.C. 55	P.U.C. 79 T.D.C. 75	P.U.C. 68 T.D.C. 80	P.U.C. T.D.C. 60 65	P.U.C. T.D.C. 417 450
Ranbir Singh H.S. School	75 65	65 78	87 80		
G. Boys H.S. School Gandhi Nagar		35 30		60 65	190
G.G.H.S. School Canal Road			100 100	88 80	368
G.G.H.S. School Rehari	40 60				100
G.G.H.S. School Shastri Nagar				90 85	175
G.G.H.S. School Mubarak Mandi	80 70	81 80		62 70	443
M.I.E.R. Experimental School	45 50	40 37	45 40		257
Total	300 300(600)	300 300(600)	300 300(600)	300 300(600)	2400

DATA COLLECTION

Collection of the following data was necessitated by the design of the study :

1. Data on adolescents studying at +2 stage of education to identify adolescents with high and low scientific, mathematical, entrepreneurial and overall creativity.
2. Data regarding the intelligence level of the adolescents.
3. Data regarding the study strategies employed by the adolescents.
4. Data concerning the interpersonal relations of the adolescents both at home and in school.
5. Data concerning the perceived self-images of the adolescents.
6. Data regarding the scholastic achievement of the adolescents.
7. Data on self-initiated activities among the adolescents.
8. Data regarding the vocational preferences of the adolescents.
9. Data on locus of control to assess the extent of internal or external control adolescents have over their environment.

Apart from the above, data regarding test-retest reliability of batteries of tests of scientific, mathematical and entrepreneurial creativity were also gathered by readministering the test batteries after predetermined intervals of time.

TOOLS USED

In order to collect the above mentioned data, the investigators employed a number of tools.

- a) For measuring scientific creativity, Battery of Tests of Scientific Creativity specially prepared and standardized by the investigators was employed.
- b) For measuring mathematical creativity, Battery of Tests of Mathematical Creativity specially prepared and standardized by the investigators was employed.
- c) For measuring entrepreneurial creativity, Battery of Tests of Entrepreneurial Creativity specially prepared and standardized by the investigators was utilised.
- d) For measuring general creativity level of adolescents, Batteries of MIER Tests of Verbal and Non-Verbal Creativity developed and standardized by Gupta (1975) were utilized.
- e) The perceived real self-images of the adolescents in terms of personality adjectives were delineated by using an abridged form of Deo's Personality Word List standardized by Dr. Pratibha Deo (1960).
- f) The interpersonal relations with teachers, parents, friends and siblings of the adolescents at the +2 stage were gauged by using the Interpersonal Relations Inventory constructed by the investigators for the present study.
- g) The study habits of adolescents were assessed through the use of the Study Habits Questionnaire specially developed by the investigators for the present study.
- h) The Hindi adaptation of Rotter's IE scale by Dr. Y.P. Aggarwal was used to obtain an index of the degree of control (internal or external) ^{an} adolescent has over his/her environment in extreme conditions.

- i) To know the vocational aspirations of the adolescents, The Vocational Preference Checklist constructed by Gupta, Srinivasan et. al (1985) was utilised.
- j) To elicit information regarding the range and number of activities engaged in by the adolescents during their school term, a modified version of Torrance's Things Done on Your Own Checklist in Hindi was employed. This had been modified by Passi (1971)
- k) The level of intelligence of the +2 level adolescents was estimated with the help of the Group Test of General Mental Ability by Jalota and Tandon.

A brief discussion of the tools mentioned above is as follows :

1. MIER TESTS OF VERBAL & NON-VERBAL CREATIVITY

The original verbal battery developed by Gupta (1975) consisted of 14 tests out of which the following four items were selected for the current investigation.

a) HYPOTHESES TEST

In this subtest, a situation is provided in which the subject/^{is} encouraged/required to generate different hypotheses in a given time of 5 minutes, as to why smoke is coming out of a friend's house, where the subject is going for a feast.

b) EXPLORATIONS TEST

In this subtest, the situation of a shipwreck is provided and the subject is asked to imagine himself on an isolated island. He/she is required in a time period of 15 minutes to list different activities that he/she would engage in on that island.

c) CODED LETTER TEST

A situation is provided of which the subject is made a part. The subject is required to convey, in terms of a cryptogram in a given time of 10 minutes, a statement to the police so that the thieves, attempting to stage a theft may be foiled in time.

d) (i) PALINDROMES TEST

The respondent is required to write as many palindromes (meaningful words which sound the same when read both backwards and forwards) as he can in a given time of 5 minutes.

d)(ii) WORD TRANSFORMATION TEST

The subject is required to write in a given time limit of 5 minutes, such words in the Hindi language, from which if one alphabet/syllable is removed, the remainder would form a meaningful English word.

The original non-verbal creativity^{test} battery developed and standardised by Gupta (1975) consisted of 7 items out of which the following 2 were selected for inclusion in the present investigation.

a) BRICKS DRAWING TEST

In this non-verbal subtest, the respondent is asked to use bricks in making as many pictures/sketches of objects as he can from a large number of bricks provided to him, in a given time limit of 5 minutes.

b) FIGURE CONSTRUCTION TEST

In this subtest, three geometrical shapes (a circle, a square and a triangle are provided. Using twelve of these figures, the subject is asked to construct a human figure. At least one

geometrical shape of each type must be utilised by him/her in drawing the human figure. The time limit for this test is 5 minutes.

SCORING SCHEMES FOR THE VERBAL & NON-VERBAL BATTERIES OF CREATIVITY

The scoring was confined to both conventional and new creativity dimension like fluency, flexibility originality and elaboration novelty and transformation (Guilford's terminology).

The sum of fluency, flexibility, originality/elaboration/transformation constituted the total creativity score of a respondent on the verbal and non-verbal tests of creativity. The tests are both reliable and valid. The indices of test, retest reliability, scorer and intra scorer reliability are quite satisfactory. Similarly the batteries have high content validity, construct validity, concurrent validity and factorial validity respectively (Gupta, 1975). Details are given elsewhere (Gupta, 1977).

2. PERSONALITY WORD LIST

This checklist, developed and standardized by Dr. Pratibha Deo (1960), consists of 275 adjectives. The respondents are required to put a tick mark against those adjectives which best describe themselves (perceived real). Scores on self concept can be derived by using scoring keys. However, since PWL was used to delineate self-images, scoring was accomplished by plotting frequencies on the basis of the adjectives tick marked by the adolescents, belonging to each subgroup. Percentages of the total number of students marking each adjective was calculated to delineate the self-images of a particular sub-group.

3. INTERPERSONAL RELATIONS

To know the extent of interpersonal relations of the adolescents with their parents, teachers, friends and siblings, the Interpersonal Relations Inventory was employed. The inventory is

divided into 4 parts viz. child-parent interpersonal relations, teacher-pupil interpersonal relations, interpersonal relations with friends and interpersonal relations with siblings. Each part consist of 30 items making up a total of 120 items. The subjects were asked to respond in terms of always, frequently, occasionally, seldom and never. Scoring was accomplished by assigning marks on a 5 point scale. Positive, healthy relationships anywhere on the scale earned marks +5+4+3+2+1 and the not-so-conducive relationships earned marks -5-4-3-2-1.

STUDY HABITS QUESTIONNAIRE

In order to assess the strategies adopted by the students for studying the Study Habits Questionnaire developed by the investigators was used. This questionnaire consists of 150 items covering different aspects of individual's studying behaviour. The subjects were asked to tick mark (on a specially prepared response sheet) against those items which represented their own study habits. The items were placed into the following categories (a) Habits with regard to time and duration (b) Habits with regard to mode of study (c) Habits with regard to planning the study (d) Habits with regard to preparation for examination (e) Habits with regard to classroom study (f) Habits with regard to extra-reading and notes making (g) Habits with regard to memorization.

Scores on the above dimensions can be derived along with a total score.

5. LOCUS OF CONTROL

To obtain an index of the degree of control a person has over his environment in extreme conditions, Rotter's IE scale adapted to Indian conditions by Y.P. Aggarwal was used. The scale consists of 29 items, each divided into two parts 'a' and 'b' depending on his/her belief in the statement. Scoring was done

awarding one point to each item scored by the students.

6. VOCATIONAL PREFERENCES CHECKLIST

To know the job aspirations of the adolescents at the +2 stage, the Vocational Preferences Checklist developed by Gupta, Srinivasan et. al (1985) was utilised. The checklist consists of 200 important vocations. The students were required to list 10 vocations in order of preference which they would like to choose for themselves in life. They were provided with a specially prepared response sheet. Scoring was accomplished by assessing the responses of the groups of students in arts, science, commerce streams separately.

7. THINGS DONE ON YOUR OWN CHECKLIST

To estimate the number of activities performed by the respondents on their own and during school term, a modified version of "Torrance's Thing Done on Your Own Checklist" by B.K. Passi was used. This checklist consists of 150 different activities which creative children indulge in. The respondents were required to put a tick mark against those activities which they undertake through self-initiation and effort, on a specially prepared response sheet. Scoring was done by simply adding the number of activities marked.

8. BATTERY OF TESTS OF SCIENTIFIC CREATIVITY

To measure scientific creativity, the newly developed battery of tests of scientific creativity was used. The battery consists of 5 items/subtests in the final draft covering a wide variety of areas. Interesting and thought provoking situations are provided and students are encouraged to give original, novel, **interesting** unusual and imaginative responses. The tests yield scores on both the conventional and new dimensions of creativity

like fluency, flexibility, originality, novelty, elaboration, transformation, productive designing, ability and inventiveness respectively. A time period of 1 hour is nearly required for completing the tests of scientific creativity. Details of items, item analysis, reliability and validity have been given in Chapter IV.

BATTERY OF TESTS OF ENTREPRENEURIAL CREATIVITY

To measure entrepreneurial creativity, the newly developed Battery of Tests of Entrepreneurial Creativity was used. The battery consists of 4 items/subtests, covering areas like production distribution/marketing, consumption etc. Novel and interesting situations were framed. Students were encouraged to furnish original, unique, imaginative and unusual responses. This battery yields scores on the conventional dimensions of creativity namely, fluency, flexibility and originality. A time limit of 50 minutes is sufficient for responding to the test battery. Details of items, item analysis, reliability and validity have been given in Chapter IV.

10. BATTERY OF TESTS OF MATHEMATICAL CREATIVITY

To assess mathematical creativity at the +2 level, the newly developed Battery of Tests of Mathematical Creativity was utilised. The battery consists of 3 items/subtests. The subtests concern areas like geometrical figures, mathematical equations and square completion. Scores on the creativity dimensions like fluency, flexibility, originality and elaboration can be derived from this battery. A time period of 1 hour is required for responding to this battery. Details of items, item-analysis reliability and validity have been given in Chapter IV.

GROUP TEST OF GENERAL MENTAL ABILITY

To obtain an index of intelligence, the Group Tests of General Mental Ability by Jalota and Tandon was used. The tests consists of 100 questions to be completed in 25 minutes.

Scoring was done by assigning one mark/point for each correct answer. The total number of correct answers constituted the intelligence score of that particular individual.

STATISTICAL TECHNIQUES USED

Information To Be Secured

- 1.(a) Scores on the different batteries of tests of Scientific Mathematical and Entrepreneurial Creativity.
- 1.(b) Item Analysis on the Batteries of Tests of Creativity.
- 1.(c) Reliability Studies
 - i) Test-Retest
 - ii) Intra-Scorer
 - iii) Inter-Scorer
- 1.(d) Validity Studies
 - i) Content
 - ii) Construct
 - iii) Concurrent
2. To develop the profiles of adolescents with 'high' and low creativity in scientific, mathematical, entrepreneurial and general fields.

To compare the sets of identifications yielded by different tests of creativity.

Statistical Technique

- Frequency Counts, Means, Standard Deviations, Skewness, Kurtosis, P_{27} P_{73} and Frequency Polygons.
- Mean, Standard Deviation, Significance of Difference ^{Between} Means, and Discrimination Indices.
- Product Moment Coefficient of Correlation.
- i) Product Moment Coefficients of Correlation.
 - ii) Significance of Difference between group means (Contrasted group Analysis).
- Frequency Counts, Means, Standard Deviations, Percentiles Significance of Differences Between Means. (Contrasted Group Analysis).

Chi Square Test of Independence

Information To Be Secured

3. To see the differential weightage of different variables towards (a) Scientific Creativity (b) Mathematical Creativity (c) Entrepreneurial Creativity.

Statistical Technique

Analysis of Variance, Partial Correlations, Multiple Correlations and Multiple Regression Equation.

MODE OF CALCULATION

All the major statistical computations in the present study were carried out on the IBMPCEXT083, installed at the ICSSR, New Delhi. The SPSS software was utilised for data processing.

CHAPTER FOUR

DESCRIPTION AND STANDARDIZATION OF THE
BATTERIES OF TESTS OF CREATIVITY4.1. INTRODUCTION TO
TESTS OF MATHEMATICAL
CREATIVITY

The Battery of Tests of Mathematical Creativity was developed by the investigators to identify mathematical talent at the +2 stage (12 to 17 years). The theoretical framework for the construction of the test was provided by empirical studies on the nature and nurture of mathematical creativity. In this battery, the situations provide a chance to the adolescents to utilise their mathematical talents to the maximum possible extent. Tasks pertaining to the creativity dimensions of fluency, flexibility, originality and transformation have been used in the construction of the battery of tests of mathematical creativity.

4.2. RATIONALE FOR THE
SUBTESTS IN THE BATTERY
OF TESTS OF MATHEMATICAL
CREATIVITY

The assumptions underlying the choice of subtests for the battery were :

- a) Students are keenly interested in learning mathematics through the medium of mathematical figures and symbols
- (b) Adolescents at the +2 level are familiar with the principles of addition, subtraction, multiplication, division, square roots, decimals and squares.
- (c) Students are interested in performing activities which, given freedom to exercise their imagination result in free play of thought processes.
- (d) An Adolescent studying mathematics at the +2 stage would be interested in arithmetic, algebra and geometry etc.

4.3. DESCRIPTION OF
SUBTEST I - 'DIVIDING
CIRCLE TEST'

Subtest 1 in the Battery of Tests of Mathematical Creativity represents the non-verbal aspect of mathematical creativity. The respondents are required to divide a geometrical figure of a circle into as many different parts as possible, such that each part resembles a

geometrical shape. The subjects are also required to write the names of the figures. A time limit of ten minutes is given to complete this test.

The 'Circle Completion Test' is scored for fluency, flexibility and elaboration respectively. The scoring procedure of these dimensions has been given below :

FLUENCY Fluency is represented by the number of right, relevant and unrepeatd responses. One score was given for each right, unduplicated and pertinent response.

FLEXIBILITY Mathematical flexibility is represented by the ability to solve mathematical problems through different approaches. One score is given for each approach.

ELABORATION Elaboration is represented by a person's ability to add pertinent details (more ideas) to the minimum and primary responses to the stimulus figure. The minimum and primary response to the stimulus figure is that response, which gives essential meaning to the mathematical figure. One score is given for each additional idea.

The total ^{creativity} score on this subtest in the Battery of Mathematical Creativity is obtained by combining the scores on fluency, flexibility and elaboration respectively.

4.3.1. SUBTEST II 'SQUARE COMPLETION TEST'

This subtest involves free play with numbers. Here the respondents are required to fill nine squares, using any integer from one to nine in any arrangement, so that each line of the square horizontally, vertically and diagonally total 15. A set of four rules are to be adhered to. A time limit of 15 minutes is provided in order to complete this test.

Subtest II viz; Square Completion Test. in the Battery of Tests of Mathematical Creativity is scored for fluency, flexibility and originality. The scoring procedure for originality is given below :

ORIGINALITY A score on this creativity dimension indicates an individual's ability to produce ideas or give responses in words or in terms of figures/outlines, which are neither obvious nor common place. Since the measurement of originality is in terms of the statistical uncommonness of the response according to a predetermined criterion, it was decided to assign originality weights as follows :

PERCENTAGE OF RESPONSES	ORIGINALITY WEIGHTAGE
More than 10%	0
More than 7% to 10%	1
More than 5% to 7%	2
More than 3% to 5%	3
More than 1% to 3%	4
By 1% or less	5

The total ^{creativity} score on this subtest is calculated by combining the scores on fluency, flexibility and originality respectively.

4.3.2. SUBTEST III In this subtest, the subjects are required
'EQUATIONS TEST' to make as many equations as they can, by
 employing integers from one to nine and the seven symbols (+, -, x, ÷, /, ., and ()²).

This subtest was scored for fluency, flexibility and originality. By adding the scores obtained on these three dimensions of creativity, the total score on this subtest is calculated. The

scoring procedures for fluency, flexibility and originality have been explained in the earlier sections. The total score on the battery of tests of mathematical creativity is obtained by adding the scores on each subtest in the battery.

The attributes called into play while responding to the batteries of tests of mathematical creativity are :

- a) Figural Imagination
- b) Imaginative Play With Numbers
- c) Persistence
- d) Inquisitiveness
- e) Curiosity
- f) Ingenuity

4.4. RATIONALE FOR THE SUBTESTS INCLUDED IN THE BATTERY OF TESTS OF ENTREPRENEURAL CREATIVITY

The assumptions underlying the choice of subtests I, II, III and IV in the Tests of Entrepreneurial Creativity were : (a) Adolescents studying

at the +2 stage in the stream of commerce are keenly interested in learning the principles of commerce through the medium of interesting, novel, thought provoking and ingenious problems.

b) Adolescents at the +2 level in commerce^{subjects} are familiar with the concept and uses of land, labour, capital and enterprise.

c) Students are interested in performing activities which involve self-initiated thinking, providing freedom for free play of imagination, resulting in response to a challenging situation directly relating to their field of study.

4.5. DESCRIPTION OF SUBTEST I - 'IDENTIFYING CHARACTERISTICS TEST'

In this subtest, the subject is required to list maximum possible different and unique characteristics of an ideal enterprising businessman

for today's world, in a given time limit of 10 minutes. 'Identifying Characteristics Test' is scored for fluency, flexibility and originality respectively. The total creativity score for this subtest is obtained by combining the scores on fluency, flexibility and originality.

4.5.1. SUBTEST II
'PROBLEMS IDENTIFICATION
TEST'

This subtest requires the respondent to imagine himself / herself to be a very successful businessman. In a given time limit of 5 minutes, the subject has to identify maximum possible problems, which a new business firm about to start manufacture of a fast selling consumer product, is likely to face from planning to production stages. The 'Problems Identification Test' is scored for fluency, flexibility and originality respectively. The total creativity score on this subtest is obtained by adding the scores on fluency, flexibility and originality.

4.5.2. SUBTEST III
'INSPECTION TEST'

In this subtest, the respondent is required to place himself / herself in the position of an industrialist with vast experience, whose name has been included in a High Power Commission, to investigate as to why a particular company is not making the anticipated profit. The subject has to list in a given time period of 15 minutes, what different aspects he/she would inspect in the company's factory so that wide ranging information regarding the performance of the company can be received. The 'Inspection Test' is scored for the creativity dimensions viz : fluency, flexibility and originality respectively. The total creativity score on this subtest is obtained by combining the scores on fluency, flexibility and originality.

4.5.3. SUBTEST IV
'METHODS ADOPTION TEST'

In this subtest, the subject is required to write as many new and different methods he/she would adopt, as a marketing manager - cum-partner in a big firm, to promote the sales of the firm's latest product. The time limit for responding to this test is 20 minutes. The subtest 'Methods Adoption Test' is also scored for fluency, flexibility and originality respectively. The total creativity scores, on this subtest is obtained by combining the scores on fluency, flexibility and originality.

The scoring schemes for the creativity dimensions utilised in the Battery of Tests of Entrepreneurial Creativity have already been explained in detail, while dealing with the Battery of Tests of Mathematical Creativity in Sections 4.3., and 4.3.2.

The creative attributes called into play while responding to the subtests in the Battery of Tests of Entrepreneurial Creativity are :

- a) Sensitivity to Problems
- b) Evaluative Capacity
- c) Powers of Observation
- d) Ingenuity
- e) Detailed Attention
- f) Managerial Imagination
- g) Adventurous Thinking and Risk Taking Potential
- h) Spontainiety
- i) Goal Directedness
- j) Verbal Fluency and Flexibility
- k) Business Acumen
- l) Organizational Efficiency
- m) Innovativeness

4.6. RATIONALE FOR THE SUBTESTS INCLUDED IN THE BATTERY OF TESTS OF SCIENTIFIC CREATIVITY

The assumptions underlying the choice of subtest I, II, III, IV and V were:

- a) Adolescents studying in the Science stream, at the +2 level in education

are familiar with the concepts involved in Physics and Chemistry.
 b) Students are eager to learn Science through the problem solving approach. (c) Students are interested in performing activities involving inquisitiveness, spontainiety, imagination and challenge.

4.6.1. DESCRIPTION OF SUBTEST I - 'ZERO FRIC-TION CONDITIONS TEST'

In this subtest, the respondent is required to write the maximum number of different but important effects / changes in the practicals he/she does

in his/her institutions' laboratory, that would be brought about by

"Zero Friction Conditions". A time span of 10 minutes is provided for responding to this subtest.

The 'Zero Friction Conditions Test' is scored for fluency, flexibility and originality respectively. A composite creativity score on this subtest is obtained by adding the scores on fluency, flexibility and originality.

4.6.2. SUBTEST II
'APPARATUS SELECTION
TEST'

In this subtest the respondent is required to place himself/herself in the position of a top scientist and a Nobel Prize winner, selected as part of a team, to explore an unknown planet outside the solar system. For this purpose, the subject has to select 10 scientific instruments/apparatus of his/her choice which are essential for conducting scientific experiments, in outer space, in the field of Chemistry. A time span of 10 minutes is provided for responding to this subtest.

The 'Apparatus Selection Test' is scored for fluency, flexibility and inventiveness respectively. The total creativity score on this subtest is obtained by combining the scores on fluency, flexibility and inventiveness.

4.6.3. SUBTEST III
'MEDICINE PREPARATION
TEST'

In this subtest, the respondent is asked to imagine himself to be a great scientist, who has succeeded in inventing a technique for manufacturing a medicine called 'Endometroniocine' which can cure all diseases. In a given limit of 5 minutes, the subject has to write the names of the different substances/materials/things from which the medicine 'Endometroniocine' can be prepared.

The subtest 'Medicine Preparation Test' is scored for the creativity dimensions viz. fluency, flexibility and originality respectively. A composite creativity score on this subtest, is obtained by adding the scores on fluency, flexibility and originality.

4.6.4. SUBTEST IV
'METHOD ADOPTION TEST'

In response to this subtest, the subject is required to explain the stages or the process, by following which the medicine 'Endometroniocine' can be prepared. A time limit of 10 minutes is given for responding to this subtest, which is scored for fluency, flexibility, novelty respectively.

The total creativity score on this subtest, is obtained by combining the scores on fluency, flexibility, novelty .

4.6.5. SUBTEST V
'MEDICINE PLANT TEST'

Using his/her imagination, inventiveness and designing ability, the respondent^{on this subtest} is required to draw the sketch or outline of a complex machine, in which the medicine called 'Endometroniocine' (prepared by the subject) can be made. A time limit of 15 minutes is provided for responding to this subtest.

The 'Medicine Plant Test' is scored for fluency, flexibility and productive designing ability respectively. The total creativity score on this subtest is obtained by adding the scores on fluency, flexibility and productive designing ability.

The attributes called into play while responding to the battery of tests of scientific creativity are :

- a) Discerning Insight
- b) Establishing Connections
- c) Sensitivity to Problems
- d) Power of Observation
- e) Ingenuity
- f) Production Abilities (related to systems, implications and transformation).
- g) Verbal Fluency and Flexibility
- h) Detailed Attention
- i) Mental Shifts
- j) Inquisitiveness
- k) Spontaneity
- l) Combination of Convergent & Divergent Thought
- m) Playful Thinking

4.7. ITEM ANALYSIS : INTRODUCTION

In the process of standardization of a newly constructed psychological test, "preliminary tryout" or "pretesting" happens to be an important step. A pretest furnishes vital clues regarding the weaknesses in the instruction and in the format, and thus helps the test constructor to establish reasonable time limits and desirable length for his test/tests. Try-out also furnishes valuable data regarding the items which clears the path for a thorough "item-analysis". According to Guilford (1954), item analysis provides objective information concerning the items included in a test. This, it does, by yielding two kinds of information - one an index of item difficulty and second, an index of item validity whereby, we may know how well the item measures or discriminates in agreement with the rest of the test, or how well it predicts some criterion. Item analysis also provides an opportunity to check up on the test writer's subjective judgement in selecting the items composing the test and also shows how the examinees react to the test in general and to the items in particular. In the light of the above, it was considered essential to item analyse the preliminary drafts of the tests of scientific, mathematical and entrepreneurial creativity.

4.8. ITEM ANALYSIS : METHOD AND PROCEDURE

For item-analysing the newly developed Tests of Scientific, Mathematical and Entrepreneurial Creativity, the established technique of item-analysis, based on the method of Davis (1952) of finding indices of item difficulty values was not considered for the reason that the tests were not of achievement type, there being no question of a right or wrong response in any subtest. All items could thus be presumed to have theoretically the same difficulty value. Item analysis was, therefore, restricted to the

determination of the indices of item validity. The extent to which a particular item discriminates between the high and low achievers on the item, was taken as an index of item validity. To this end, the indices of discrimination between the high and low achieving groups were worked out.

Item-analysis was carried out by finding the Upper-Lower Index proposed by Johnson has recommended the computation of an upper-lower index, based on the responses of two extreme groups containing 27% cases in each category respectively.

370 scored answer scripts, from the tryout sample were arranged in descending order on ^{the basis of scores on} each dimension and type of creativity viz : Scientific, Mathematical and Entrepreneurial. The upper 100 (copies/scores) were of those students, who had given the most creative responses on a particular dimension/subtest, in the respective batteries. This group was named as the "upper group". Scores of 100 students who had given the least creative responses to the various tests, were identified as the "lower group". Thereafter, the means and standard deviations (dimension wise as well as, subtest wise) were computed, in case of both the upper and ^{the} lower groups. Next, the significance of difference between the means of the two contrasted groups were computed, in order to derive the "Critical Ratio ". If the value of a critical ratio was significant beyond .01 or .05 level of confidence, the particular subtest/dimension was considered to possess a genuine discriminating power and was considered a valid test for inclusion in the battery of which it formed a part. Item Analysis for each dimension as well as subtest in the batteries of scientific, mathematical and entrepreneurial creativity was thus carried out.

4.9. ITEM ANALYSIS ON TESTS OF SCIENTIFIC, MATHEMATICAL ENTREPRENEURIAL CREATIVITY :

RESULTS

The results of item analysis have been reproduced in the Tables 4.1 to 4.6 :

TABLE - 4.1

DISCRIMINATION INDICES BETWEEN THE UPPER AND THE LOWER GROUPS ON THE DIFFERENT DIMENSIONS OF SCIENTIFIC CREATIVITY						
DIMENSION	GROUP	N (NUMBER)	MEAN M	STANDARD DEVIATION S D	SED (SIG. OF DIFFEREN- CE)	DISCRIMI- NATION INDEX 't'
FLUENCY	U	100	20.22	5.88	.63	21.06 *
	L	100	6.95	2.28		
FLEXIBILITY	U	100	12.15	1.96	.25	35.00 *
	L	100	3.40	1.53		
ORIGINALITY	U	100	70.90	12.66	1.46	34.45 *
	L	100	20.60	7.10		
INVENTIVENESS	U	100	22.25	7.48	.77	25.80 *
	L	100	2.38	1.81		
PRODUCTIVE DESIGNING ABILITY	U	100	28.39	3.12	1.05	25.065 *
	L	100	15.26	3.22		

* Significant beyond .01 level

U means upper group

L means lower group



TABLE - 4.2

DISCRIMINATION INDICES BETWEEN THE UPPER AND THE LOWER GROUPS
ON THE DIFFERENT DIMENSIONS OF MATHEMATICAL CREATIVITY.

DIMENSION	GROUP	N (NUMBER)	MEAN M	STANDARD DEVIATION S D	ED (SIG. OF DIFFER- ENCE)	DISCRIMI- NATION INDEX 't'
FLUENCY	U	100	16.37	2.21	.26	37.38 *
	L	100	6.65	1.28		
FLEXIBILITY	U	100	13.39	2.19	.26	33.69 *
	L	100	4.63	1.29		
TRANSFORMATION	U	100	66.15	9.72	1.18	35.70 *
	L	100	24.02	6.68		
ORIGINALITY	U	100	15.82	5.37	.650	19.60 *
	L	100	3.08	1.72		

* Significant beyond .01 level

U means upper group

L means lower group



TABLE - 4.3

DISCRIMINATION INDICES BETWEEN THE UPPER AND THE LOWER GROUPS
ON THE DIFFERENT DIMENSIONS OF ENTREPRENEURIAL CREATIVITY.

DIMENSION	GROUP	N (NUMBER)	MEAN M	STANDARD DEVIATION S.D.	ED (Sig. OF DIFFERENCE NCE)	DISCRIMI- NATION INDEX 't'
FLUENCY	U	100	25.80	3.56	.46	38.65 *
	L	100	8.02	2.79		
FLEXIBILITY	U	100	21.88	3.62	.43	40.04 *
	L	100	4.66	2.32		
ORIGINALITY	U	100	28.55	7.86	.82	30.39
	L	100	3.63	2.24		

* Significant beyond .01 level

U means upper group

L means lower group

TABLE - 4.4.

DISCRIMINATION INDICES (SUBTEST WISE) BETWEEN THE UPPER AND LOWER GROUPS ON TESTS OF SCIENTIFIC CREATIVITY.

TITLE OF THE SUBTEST	ORDER OF THE SUBTEST IN THE BATTERY	GROUP	N (NUMBER)	MEAN	STANDARD DEVIATION	ED (SIG.OF DIFFERENCE)	DISCRIMINATION INDEX 't'
"ZERO FRICTION CONDITIONS TEST"	1	U	100	17.69	4.11	.437	31.55 *
		L	100	3.90	1.49		
"APPARATUS SELECTION TEST"	2	U	100	26.14	4.15	.488	36.76 *
		L	100	8.2	2.60		
"MEDICINE COMPONENTS TEST".	3	U	100	29.51	6.64	.725	33.14 *
		L	100	5.48	2.92		
"MEDICINE PROCESS TEST"	4	U	100	35.70	8.74	.94	30.98 *
		L	100	6.58	3.41		
"MEDICINE PLANT TEST"	5	U	100	16.76	3.21	.37	34.57 *
		L	100	3.97	1.93		
TOTAL SCORE ON THE BATTERY OF TESTS OF SCIENTIFIC CREATIVITY.		U	100	102.4	16.88	1.94	28.94 *
		L	100	46.25	9.60		

* Significant beyond .01 level

U means upper group

L means lower group

TABLE - 4.5

DISCRIMINATION INDICES (SUBTEST WISE) BETWEEN THE UPPER AND LOWER GROUPS (TOP AND BOTTOM) ON TESTS OF MATHEMATICAL CREATIVITY

TITLE OF THE SUBTEST	ORDER OF THE SUBTEST IN THE BATTERY	GROUP	N (NUMBER)	MEAN	STANDARD DEVIATION	ED (SIG. OF DIFFERENCE)	DISCRIMINATION INDEX 't'
"DIVIDING CIRCLE TEST"	1	U	100	59.65	9.32	1.08	34.61 *
		L	100	22.27	5.38		
"SQUARE COMPLETION TEST"	2	U	100	19.6	9.35	0.88	20.41 *
		L	100	1.64	.922		
"EQUATIONS TESTS"	3	U	100	35.24	8.47	.86	39.98 *
		L	100	.70	1.68		
TOTAL SCORE ON THE BATTERY OF TESTS OF MATHEMATICAL CREATIVITY		U	100	93.15	11.48	1.45	39.72 *
		L	100	35.55	8.90		

* Significant beyond .01 level

U means upper group

L means lower group

TABLE - 4.6

DISCRIMINATION INDICES (SUBTEST WISE) BETWEEN THE UPPER AND LOWER GROUPS (TOP AND BOTTOM) ON TESTS OF ENTREPRENEURIAL CREATIVITY.

TITLE OF THE SUBTEST	ORDER OF THE SUBTEST IN THE BATTERY	GROUP	N (NUMBER)	MEAN	STANDARD DEVIATION	ED (SIG.OF DIFFERENCE)	DISCRIMINATION INDEX 't
IDENTIFYING CHARACTERISTICS TEST"	1	U	100	23.34	6.72	.70	26.68 *
		L	100	4.66	2.13		
"PROBLEMS IDENTIFICATION TEST"	2	U	100	23.78	5.01	.56	33.26 *
		L	100	5.15	2.36		
"INSPECTION TEST"	3	U	100	23.66	6.28	.65	30.44 *
		L	100	3.87	1.46		
"METHOD ADOPTION TEST"	4	U	100	22.25	7.48	.77	25.80 *
		L	100	2.38	1.81		
TOTAL SCORE ON THE TEST BATTERY OF ENTREPRENEURIAL CREATIVITY		U	100	77.70	13.56	1.51	35.76 *
		L	100	23.70	6.78		

* Significant beyond .05 and .01 levels.

U means upper group

L means lower group

4.10. ITEM ANALYSIS : The indices of discrimination computed between DISCUSSION OF THE the upper and lower groups on each creativity RESULTS. dimension, as well as on each subtest, in the case of batteries of tests of scientific, mathematical and entrepreneurial creativity, have been given in Tables 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6 respectively.

From Tables 4.1, 4.2 and 4.3 which show the discrimination indices computed between the "upper" and ^{the} "lower" groups. on scientific, mathematical and entrepreneurial fluency, it can be concluded that the indices on fluency are significant beyond .01 level of confidence. In other words, the scores on fluency, in ^{the} batteries of tests of scientific mathematical and entrepreneurial creativity can genuinely differentiate between the upper and ^{the} lower groups. The largest discrimination between the two groups, has been found in the case of entrepreneurial fluency, followed by mathematical and scientific fluency respectively.

Discrimination indices computed between the "upper" and ^{the} "lower" groups, identified on the basis of their flexibility scores, on the tests of scientific, mathematical and entrepreneurial creativity, are all significant beyond .01 level of confidence. This shows that genuine discrimination exists between the two groups on flexibility. The largest discrimination on the scores of flexibility. can be seen in the case of entrepreneurial creativity followed by scientific and mathematical creativity.

The discrimination indices between the "upper" and ^{the} "lower" groups, on the basis of their originality scores on the scientific, mathematical and entrepreneurial batteries. are significant beyond .01 level of confidence, and prove that genuine differentiation exists between the two groups on originality scores. The largest discrimination has been found in case of the scores on originality, in scientific creativity, followed by entrepreneurial and mathematical creativity.

The discrimination index between the "upper" and ^{the} "lower" groups on the basis of their inventiveness scores on the scientific test battery, is significant beyond .01 level of confidence. This indicates that genuine differentiation exists between the two groups on the creativity dimension of inventiveness.

That there exists genuine differentiation between the "upper" and ^{the} "lower" groups, on the basis of their scores on the creativity dimension namely "productive designing" ^{ability} in the battery of tests of scientific creativity, is shown by a discrimination index which is significant beyond .01 level of confidence.

The discrimination index between the "upper" and ^{the} "lower" groups on the basis of their scores on the creativity dimension namely "transformation", in the mathematical battery, is significant beyond .01 level of confidence, which is indicative of the fact that genuine discrimination exists between the two groups on the dimension of transformation.

The discrimination indices between the scores of the "upper" and ^{the} "lower" groups, on each subtest in the battery of tests of scientific creativity namely, 'Zero-Friction Conditions Test', 'Apparatus Selection Test', 'Medicine ~~Components~~ Test', 'Medicine Process Test' and 'Medicine Plant Test' respectively, are significant beyond .01 level of confidence. The largest differentiation between the upper and ^{the} lower groups, which can be noticed among the subtests of scientific creativity, is shown by the 'Apparatus Selection Test', followed by the 'Medicine Plant Test', 'Medicine Component Test', 'Zero Friction Conditions Test' and 'Medicine Process Test' respectively.

The discrimination indices between the scores of the upper and lower groups, on all the subtests in the battery of tests of mathematical creativity viz : 'Dividing Circle Test', 'Square Completion Test', and 'Equations Test' are all significant beyond

.01 level of confidence. This shows that genuine differentiation exists between the two groups on the subtests in the mathematical battery. The largest differentiation between the two groups which can be noticed is indicated by the 'Equations Test' followed by the 'Dividing Circle Test' and ^{the} 'Square Completion Test' respectively.

The Discrimination indices between the scores of the "upper" and ^{the} lower groups, on each subtest in the battery of tests of entrepreneurial creativity, are all significant beyond .01 level of confidence. The largest differentiation between the upper and ^{the} lower groups in the subtests of entrepreneurial creativity has been found in ^{the} case of 'Problems Identification Test', ^{followed by the} 'Identifying Characteristics Test' and ^{the} 'Method Adoption Test' in order of discrimination values.

The discrimination indices worked out on the basis of the total scores of the "upper" and "lower" groups on each type of creativity namely, Scientific, Mathematical and Entrepreneurial are reported in Tables 4.4, 4.5 and 4.6. ^{These} show that maximum difference among the upper and lower groups exists in the area of mathematical creativity, followed by entrepreneurial and scientific creativity respectively. All the obtained discrimination indices are significant beyond .01 level of confidence.

4.11. ITEM ANALYSIS: CONCLUSIONS

In the light of the above results, it may be concluded, that the item scores on the different dimensions of creativity on the one hand, and scores on different subtests on the other, in the three batteries of creativity, has yielded useful information regarding the composition of the batteries and on the adequacy of the scoring schemes developed for the various tests. The following conclusions emerge after item analysis :

- 1) All the five subtests included in the battery of tests of scientific creativity ('Zero Friction Conditions Test', 'Apparatus Selection Test', and 'Medicine Plant Test'); three subtests in the mathematical battery, ('Dividing Circle Test', 'Square Completion Test' and 'Equations Test') and four subtests in the battery of tests of entrepreneurial creativity ('Identifying Characteristics Test', 'Problems Identification Test', 'Inspection Test' and 'Method Adoption Test') have been found to be capable of eliciting adequate responses, from the boys and girls from 12 to 17 years of age, for whom the tests were developed.
- 2) Since all the subtests in the batteries of tests of scientific mathematical and entrepreneurial creativity have shown capacities to elicit adequate, scorable and valid responses, it can be inferred that the language and the format of the test items, as also the time limits fixed for giving responses and the instructions are adequate.
- 3) The item analysis results have also brought to light, the suitability, adequacy and effectiveness of the scoring schemes developed to score the responses to the different subtests contained in the batteries of tests of scientific, mathematical and entrepreneurial creativity.
- 4) There has been found to exist a genuine differentiation between the "upper" and ^{the} "lower" groups, on the various creativity dimensions called into play while responding to the tests of scientific, mathematical and entrepreneurial creativity. This is shown by the magnitude of the obtained 't' values, which, in all cases, are significant beyond .01 level of confidence.
- 5) Adolescents with high and low creativity can be genuinely differentiated on the basis of their total scores on each subtest included in the batteries of tests of scientific, mathematical and

entrepreneurial creativity. This fact is borne out by the obtained 't' values which are all significant beyond .01 level of confidence.

6. There exist striking differences between the upper and lower groups on the basis of their total scores on scientific, mathematical and entrepreneurial creativity. This again is borne out by the obtained values of 't' all which are significant beyond .01 level of confidence.

7. On the basis of item analysis, it can thus be said that the batteries of tests of scientific, mathematical and entrepreneurial creativity are capable of eliciting adequate responses, from the adolescents studying at the +2 level of education, in the fields of science, mathematics and commerce.

4.12 RELIABILITY AND VALIDITY OF TESTS OF SCIENTIFIC, MATHEMATICAL AND ENTREPRENEURAL CREATIVITY.

RELIABILITY STUDIES; The term 'reliability' as used in the
INTRODUCTION context of psychological testing, has two
different connotations (Freeman, 1962).

Firstly, it refers to the extent to which a test is internally consistent i.e. the extent to which test scores are subject to or free from internal difficulties as will produce errors of measurement due to the quality of items rather than the unstability of performance of the testees themselves. In other words, this means how accurately is the test measuring at a particular time. Secondly, reliability refers to the extent to which an instrument yields consistent results on testing and retesting. Obviously, if a test has low reliability, it can have but limited value in predicting an individual's future performance or level of development. It is for these reasons that information about reliability of a psychological measure is of great value. Reliability of a test is of the following types :

- i) Equivalent form or Parallel Form Reliability
- ii) Method of Rationale Equivalence
- iii) Inter-Scorer Reliability
- iv) Split-Half Reliability
- v) Test-Retest Reliability

Out of the above, the method of computing reliability through the procedure of rationale equivalence was not used because, equivalent forms of the tests were not prepared. The split-half reliability was not tenable because, the length and nature of the tests were unique and consequently the test batteries could not be divided into two equal halves, on the criterion of 'equivalence'.

In the current investigation, the following three types of reliability studies were carried out :

- i) Test-Retest Reliability

- ii) Intra-Scorer Reliability
- iii) Inter-Scorer Reliability

4.13. SAMPLE SELECTION & RELIABILITY ESTABLISHMENT OF THE BATTERIES OF SCIENTIFIC, MATHEMATICAL AND ENTREPRENEURIAL CREATIVITY.

The sample for the reliability studies consisted of 300 students in all. A representative sample of 100 adolescents each for test-retest, intra-scorer and inter-scorer reliability in case of scientific creativity, 100 for the three types of reliability in case of mathematical creativity and 100 for reliability studies for entrepreneurial creativity, was taken. The adolescents included students from the low, middle, as well as high strata of society, and were representative of the main sample taken for investigation.

For the 'test-retest' reliability, the final forms of the batteries of tests of scientific, mathematical and entrepreneurial creativity were administered on the sample twice. The average retest time in each case was three weeks. After scoring the two sets of responses, the total scores obtained, were utilised for computing the product moment correlation coefficient. For the intra-scorer reliability, 100 test booklets were scored by the same investigator twice. The average interval between the two scorings was three weeks. Thereafter, the product moment correlation coefficient between the two sets of scores was computed. For ^{the} inter-scorer ^{reliability,} The time gap in this case too was three weeks. Thereafter, product moment correlation coefficient was computed between the two sets of scores. The obtained results are shown below :

4.14. RELIABILITY STUDIES ON THE BATTERIES OF TESTS OF SCIENTIFIC, MATHEMATICAL & ENTREPRENEURIAL CREATIVITY : RESULTS

TABLE - 4.7

TEST-RETEST, INTRA-SCORER AND INTER-SCORER RELIABILITY
COEFFICIENTS FOR THE BATTERY OF TESTS OF SCIENTIFIC CREATIVITY.

TYPE OF RELIABILITY	CORRELATION COEFFICIENT	SIGNIFICANCE LEVEL
Test-Retest	.976	Beyond . 01 Level
Intra-Scorer	.999	Beyond . 01 Level
Inter-Scorer	.998	Beyond . 01 Level

TABLE - 4.8

TEST-RETEST, INTRA-SCORER AND INTER-SCORER RELIABILITY COEFFICIENTS
FOR THE BATTERY OF TESTS OF MATHEMATICAL CREATIVITY.

TYPE OF RELIABILITY	CORRELATION COEFFICIENT	SIGNIFICANCE LEVEL
Test-Retest	.988	Beyond . 01 Level
Intra-Scorer	.999	Beyond . 01 Level
Inter-Scorer	.997	Beyond . 01 Level

TABLE - 4.9

TEST-RETEST, INTRA-SCORER AND INTER-SCORER RELIABILITY COEFFICIENTS FOR THE BATTERY OF TESTS OF ENTREPRENEURAL CREATIVITY

TYPE OF RELIABILITY	CORRELATION COEFFICIENT	SIGNIFICANCE LEVEL
Test-Retest	.987	Beyond . 01 Level
Intra-Scorer	.999	Beyond . 01 Level
Inter-Scorer	.972	Beyond . 01 Level

4.15. DISCUSSION OF RESULTS The highly significant values of the co-efficients of correlation shown in the tables above, offer convincing evidence, that the tests of scientific, mathematical and entrepreneurial creativity are highly reliable tools for measuring creativity of the adolescents in the fields of science, mathematics and commerce, at the +2 level. The high values of the reliability co-efficients may be attributed to the following two reasons :

1. The scoring schemes for the batteries of tests of scientific, mathematical and entrepreneurial creativity, were based on various new and old dimensions of the creative process. Objective weightages were assigned after a detailed analysis of a cross-section of responses. Thus , the scoring procedure involved minimum possible subjectivity, which explains the highly significant intra and inter-scorer reliability co-efficients.
2. Secondly inter-dependence of items is likely to reduce reliability. In the present study, each item in the scientific battery, though belonging to the fields of science, differed widely from

the others, so that each problem required a novel thought approach. The same explanation is true in case of the batteries of tests of mathematical and entrepreneurial creativity.

4.16. RELIABILITY OF BATTERIES
OF TESTS OF SCIENTIFIC,
MATHEMATICAL AND ENTREPRENEURAL
CREATIVITY :
CONCLUSIONS

The following conclusions can be drawn, regarding the reliability of the batteries of tests of scientific^{mathematical} and entrepreneurial creativity. i) The test retest reliability coefficients are highly satisfactory and

show that the batteries of the newly developed tests are stable and trust worthy.

ii) The results also establish high inter-scorer reliability coefficients in case of the batteries of test of scientific mathematical and entrepreneurial creativity. In other words, if these tests are scored by different individuals. trained for the purpose, errors due to the subjectivity of the scorers, would not play a significant part.

iii) The present results further indicate, that the scoring schemes developed for the different subtests in the three test batteries are objective in that. the same individual can score the same set of answer sheets reliably on a second occasion, without errors. This also shows that the scoring procedures, and the directions to the scorers, are adequate and objective.

iv) Since the batteries of tests of scientific, mathematical and entrepreneurial creativity have shown very satisfactory levels of test-retest reliability, intra-scorer reliability and inter-scorer reliability, it can be concluded, that all the three test batteries are reliable tools for measuring creativity of the adolescents at the +2 level, in the fields of science, mathematics and commerce.

4.17 VALIDITY STUDIES: INTRODUCTION

Validity of a test provides a direct indication of the degree to which test scores actually measure what they intend to measure. Whenever we raise a question whether a test is valid or not, another question has to be answered; it is valid for what? The name of a test may well be vague and general (Anastasi, (1968) Hence, it is essential to define the attributes measured by a given test, through the analysis of the specific criteria or other objective sources of information, if we wish to validate a test. The extent of validity is then indicated by the correlation coefficient between the test scores and the criterion scores.

The kinds of validity depend upon the kinds of inferences one might wish to draw from test scores. Four inter-dependent kinds of inferential interpretations are traditionally employed by test makers, which are :

- a) Content Validity i.e. (relevance of test items)
- b) Predictive Validity
- c) Concurrent Validity
- d) Construct Validity

Details of these may be found in Cronbach (1951); Anastasi (1968); and Guilford (1969) respectively.

For the present study, the investigators decided to establish the following kinds of validity for the batteries of tests of scientific, mathematical and entrepreneurial creativity.

- 1) Content Validity
- 2) Construct Validity
- 3) Concurrent Validity

It may however be pointed out that no attempt was made to establish the predictive validity of the tests of creativity because

of the simple reason that this type of validity study requires a longer time period and could not be completed in the proposed time for the present research. The following independent and external criteria were selected for validating purposes :

- i) Scores on Things Done On Your Own Checklist
- ii) Scores on MIER Tests of Creativity (both verbal and non-verbal)
- iii) Scores on Achievement
- iv) Scores on Intelligence.

4.18 SAMPLE FOR THE VALIDITY STUDIES

150 boys and girls belonging to the age group 12 to 17 years were selected for validity studies based on the criteria (Thing Done On Your Own Check List and MIER Tests of Creativity). Of these, 50 belonged to the science stream, 50 to the mathematics stream and 50 to the commerce stream. Validity coefficients with achievement and intelligence scores were computed on the basis of the scores of 50 adolescents belonging to the science, mathematics and commerce streams respectively.

4.19 VALIDITY STUDIES : RESULTS

4.19.1 CONTENT VALIDITY To ensure content validity the investigators tried their utmost to base the test items, the directions and the scoring procedures, on the upto date theory and research available on the topic. The items were selected after a study indepth, of the dynamics of creative processes, characteristics of the creative personalities, and after examining deeply the different types of activities contained in the available tests of creativity. All activities were based in situations where maximum involvement and interest of the pupils were called into play and in which the emphasis was on creating something new, original novel and unique. On the basis of the content then, it can be claimed that the test batteries of scientific, mathematical and entrepreneurial creativity do show evidence of content validity. However, to further validate the batteries of tests, a panel of five experienced and qualified professors were selected, each of whom was familiar with the concept and measurement of creativity. Their expert opinions

were sought regarding the justification of inclusion of different items. Only when a perfect concurrence was observed in their judgement were the test items retained in the final forms of the batteries of tests of scientific, mathematical and entrepreneurial creativity. Even then, it may be pointed out that the above tests of creativity, represent at best, only a sample of the universe of creative thinking abilities out of which the investigators have tried to assemble activities which involve interplay of many forms of creative abilities.

4.10.2 CONSTRUCT AND
CONCURRENT VALIDITY;
RESULTS

The results have been presented
in Tables 4.10, 4.11 and 4.12.

TABLE - 4.10

VALIDITY COEFFICIENTS FOR THE BATTERY OF TESTS OF
SCIENTIFIC CREATIVITY VIS-A-VIS DIFFERENT CRITERIA

CRITERION	VALIDITY COEFFICIENT	TYPE OF VALIDITY
Things done on your own checklist	.2058	Construct
Achievement	.2471	Construct
Intelligence	.4209	Construct
MIER Tests of Creativity	** .6138	Concurrent

** 1 - tailed significance <.001

TABLE - 4.11

VALIDITY COEFFICIENTS FOR THE BATTERY OF TESTS OF
MATHEMATICAL CREATIVITY VIS-A-VIS DIFFERENT CRITERIA

CRITERION	VALIDITY COEFFICIENT	TYPE OF VALIDITY
Things done on your own checklist	-.3109	Construct
Achievement	.2471	Construct
Intelligence	.4142	Construct
MIER Tests of Creativity	.2356	Concurrent

TABLE - 4.12

VALIDITY COEFFICIENTS FOR THE BATTERY OF TESTS OF
ENTREPRENEURIAL CREATIVITY VIS-A-VIS DIFFERENT CRITERIA

CRITERION	VALIDITY COEFFICIENT	TYPE OF VALIDITY
Things done on your own checklist	-.2487	Construct
Achievement	.2047	Construct
Intelligence	.4127	Construct
MIER Tests of Creativity	. ** .4779	Concurrent

** 1 - tailed significance - .001

4.20 DISCUSSION OF THE RESULTS

The validity coefficients between the scores on the Batteries of tests of Scientific, Mathematical and Entrepreneurial Creativity on the one hand and the external criteria namely, scores on Things Done On Your Own Checklist (abridged), Academic Achievement Intelligence and MIER Tests of Creativity (both verbal and non-verbal) have been reported in Tables 4.10, 4.11 and 4.12.

The validity coefficients between the scores on scientific creativity and MIER tests of Creativity (.6138), while indicating substantial correlation proves, that the newly developed battery of tests of scientific creativity has high concurrent validity. Low positive and significant correlations have been obtained between the scores on scientific creativity and scores on Things Done on Your Own Checklist and Achievement (.2058 and .2471) respectively. The correlation between the scores on scientific creativity and intelligence (.4209) is significant and moderately high. The obtained values are indicative satisfactory construct validity.

That the battery of tests of entrepreneurial creativity possess concurrent validity is indicated by the correlation with MIER Tests of Creativity (.4779) which is moderately high and significant. On the other hand, the coefficients of correlation between the scores on entrepreneurial creativity on one hand and scores on Things Done On Your Own Checklist and Achievement on the other, are -.2487 and .2047. The scores on entrepreneurial creativity and intelligence have been found to be significant but moderately correlated (.4127). The low negative correlation indicates that, the creative abilities involved in entrepreneurial creativity are not covered by the scores on Things Done On Your Own Checklist. Infact, the two sets of scores are discordant in nature. The low correlation with Achievement can be taken as a satisfactory index of construct validity of the Battery of Tests of Entrepreneurial Creativity.

Apart from a positive moderately high relationship between the scores on mathematical creativity and intelligence (.4142), scores on mathematical creativity exhibit a low negative correlation with ^{scores on} Things Done On Your Own Checklist (-.3109) and low but positive correlation with ^{scores on} achievement (.2471). While the low positive correlations are indicative of adequate construct validity, the negative correlation reinforces the argument that the scores on Things Done On Your Own Checklist and scores on Mathematical Creativity are discordant in nature and that the high scores on the former do not provide prediction in the same direction as high scores on the latter.

In the context of validity, it would be pertinent to observe that,

- a) Low coefficients of correlation whether positive or negative between two chosen sets of scores cannot be taken to indicate lack of validity of the new tests. On the contrary, this may prove that, the new test is radically different from the criterion test, and also, that it is relatively free from the influence of certain unknown factors which might boost the correlations.
- b) Significant coefficients of correlation between the three batteries of tests ^{types} of creativity and scores on intelligence are indicative of a significant relationship between the two sets of scores. This result, while proving that the tests of creativity (scientific, mathematical and entrepreneurial) possess construct validity, also corroborate the finding of a large number of researches regarding the relationship between creativity and intelligence. Studies show that upto a certain point ($IQ < 120$) creativity and intelligence go together and that to be creative, one must be intelligent. Since the sample selected included adolescents belonging to all levels of intelligence, the obtained correlations are likely to be higher than what one would normally expect if the study had been restricted to adolescents with high creativity alone.

c) One explanation for a significant degree of relationship between the scores on scientific and entrepreneurial creativity and MIER Tests of Creativity could be that, creative thinking whether in the fields of science or commerce, requires some common approaches of thought. This general factor is bound to increase the value of correlations.

d) In the present study low correlations have been found to exist between the scores on mathematical creativity and MIER Tests of Creativity. Creative thinking in mathematics it seems, requires a radically different approach altogether as compared to the more conservative creativity dimensions called into play while responding to tests of general/overall creativity. Another important ^{factor} in interpreting coefficient of correlation is the size of the sample. When we have a small N, small changes on one variable may be accompanied with large changes on the other. These changes may lower the size of the 'r' value/correlation.

4.21 VALIDITY OF THE TESTS OF SCIENTIFIC, MATHEMATICAL AND ENTREPRENEURIAL CREATI- VITY:

Notwithstanding the above observations,
the following conclusions can be drawn :

CONCLUSIONS : a) On the basis of the creative abilities called into play while responding to the batteries of tests of scientific mathematical and entrepreneurial creativity; there seems to be satisfactory indication that the tests in the three creativity batteries possess ^{adequate} content validity.

b) The batteries of tests of scientific, mathematical and entrepreneurial creativity possess both construct and concurrent validity as evidenced from the nature and magnitude of the validity coefficients computed.

4.22 RELIABILITY AND VALIDITY
TESTS OF SCIENTIFIC MATHE-
MATICAL AND ENTREPRENEURAL
CREATIVITY:

CONCLUSIONS :

To sum up, the reliability and the validity studies conducted on the Batteries of Test of Scientific, Etrepreneurial and Mathematical Creativity show convincing evidence that these batteries possess high :

- a)
 - i) Test Retest Reliability;
 - ii) Inter Scorer Reliability;
 - iii) Intra Scorer Reliability

- b) Also, the three batteries mentioned above provide convincing evidence of possessing :
 - i) Content Validity
 - ii) Concurrent Validity
 - iii) Construct Validity

It can, therefore, be concluded that the ^{three} batteries of creativity tests, developed to measure creativity in the fields of science, mathematics and commerce, are 'reliable' and 'valid' .

4.23. RELIABILITY ESTABLISHMENT OF THE STUDY HABITS QUESTIONNAIRE AND THE INTERPERSONAL RELATIONS INVENTORY.

The sample for the reliability studies consisted of 100 adolescents each for the test-retest, intra

scorer and inter-scorer reliabilities was taken up for the Study Habits Questionnaire and Interpersonal Relations Inventory. The results have been given below in Tables 4.13 and 4.14 respectively.

TABLE - 4.13

TEST-RETEST, INTRA-SCORER AND INTER-SCORER RELIABILITY COEFFICIENTS FOR STUDY HABITS QUESTIONNAIRE

TYPE OF RELIABILITY	CORRELATION COEFFICIENT	SIGNIFICANCE LEVEL
Test-Retest	.814	Beyond .01 Level
Intra-Scorer	.990	Beyond .01 Level
Inter-Scorer	.961	Beyond .01 Level

TABLE - 4.14

TEST-RETEST, INTRA-SCORER AND INTER-SCORER RELIABILITY COEFFICIENTS FOR INTERPERSONAL RELATIONS INVENTORY

TYPE OF RELIABILITY	CORRELATION COEFFICIENT	SIGNIFICANCE LEVEL
Test-Retest	.794	Beyond .01 Level
Intra-Scorer	.950	Beyond .01 Level
Inter-Scorer	.901	Beyond .01 Level

4.24. CONCLUSIONS

The following conclusions can be drawn regarding the reliability of the Study Habits Questionnaire (SHQ) and the Interpersonal Relations Inventory (IRI) :

a) The test retest reliability coefficients are highly satisfactory and show that the newly developed tests are stable and trustworthy.

b) The results also establish high inter-scorer reliability

coefficients in case of the SHQ and IRI. In other words, if these tests are scored by different individuals trained for the purpose errors due to subjectivity of the scorers would not play a significant part.

c) The present results indicate that the scoring schemes developed for the SHQ and IRI are quite objective in that the same individual can score the same set of answer sheets reliably on a second occasion, without errors. This also shows that the scoring procedures are adequate.

d) Since the SHQ and the IRI have shown very satisfactory levels of test retest, intra-scorer and inter-scorer reliability it can be concluded that both the newly developed tests are reliable tools for measuring interpersonal relations (Child-parent, teacher-pupil, siblings and friends) and study habits of adolescents at the +2 level in the fields of science, mathematics and commerce.

4.25. VALIDITY STUDIES ON THE STUDY HABITS QUESTIONNAIRE AND THE INTERPERSONAL RELATIONS INVENTORY

A sample of 100 boys and girls belonging to the +2 level were selected for the validity studies based on the

criteria (Things Done On Your Own Checklist), Achievement, Intelligence, and Tests of Creativity). A cross section of adolescents from the streams of science, mathematics and commerce and general fields were selected for validity purposes. The results of Construct and Concurrent Validity are given in Tables 4.15 and 4.16 respectively.

TABLE - 4.15

VALIDITY COEFFICIENTS FOR THE STUDY HABITS QUESTIONNAIRE
VIS-A-VIS DIFFERENT CRITERIA

CRITERION	VALIDITY COEFFICIENTS	TYPE OF VALIDITY
Things Done On Your Own Checklist	.302	Construct
Achievement	.401	Construct
Intelligence	.394	Construct
Creativity	.203	Concurrent

TABLE - 4.16

VALIDITY COEFFICIENTS FOR THE INTERPERSONAL RELATIONS
INVENTORY VIS-A-VIS DIFFERENT CRITERIA

CRITERION	VALIDITY COEFFICIENTS	TYPE OF VALIDITY
Things Done On Your Own Checklist	.214	Construct
Achievement	.246	Construct
Intelligence	.205	Construct
Creativity	.257	Concurrent

4.26. DISCUSSION AND CONCLUSIONS

The above results reveal
as under :

- 1) The validity coefficients between the Study Habits Questionnaire (SHQ) on one hand and Things Done On Your Own Checklist, Achievement and Intelligence on the other are positive, moderately high and significant. In particular the validity coefficients between study habits and the criteria namely, achievement and intelligence are fairly substantial which seems to be quite appropriate. Thus it can be said that the obtained coefficients values are indicative of satisfactory construct validity in the case of the newly developed t/

2) The same can be said of the validity coefficients between the Interpersonal Relations Inventory and the different criteria taken for establishing validity. The correlations are low but positive and significant. The obtained values can thus be taken as a satisfactory index of construct validity of the Interpersonal Relations Inventory.

3) Both the newly developed tests namely, the study habits questionnaire and the Interpersonal Relations Inventory have reported a low but positive significance with the creativity test scores. This accounts for a satisfactory concurrent validity in the case of both tests.

It can thus be concluded that the study habits questionnaire and the Interpersonal Relations Inventory possess both construct and concurrent validity as is evidenced from the nature and magnitude of the validity coefficients computed.

CHAPTER FIVE

DESCRIPTIVE DATA AND COMPARISON
OF IDENTIFICATIONS

5.1. INTRODUCTION

After the construction and standardization of the Batteries of Tests of Scientific, Mathematical creativity on the one hand, and the Interpersonal Relations Inventory and Study Habits Questionnaire, on the other, the next step involved selection of the appropriate sample for the collection of data on creativity at +2 stage so that, answers to the key questions posed for the study could be obtained as per objectives of the study.

5.2. DESCRIPTION OF
THE SAMPLE

Since the current investigation was mainly concerned with the study of creativity at the +2 stage of education, the selection of the sample was restricted to the Higher Secondary Schools, in the city of Jammu. 2400 adolescents, whose ages ranged between 12 to 17 years, of both sexes, studying in classes P.U.C. and T.D.C. (Higher Secondary Parts I and II), were randomly selected for data collection. The composition of the sample has already been furnished, in Chapter III.

5.3. DATA COLLECTED

The collection of data on the following key variables was necessitated by the current study in Phase I

- a) Data regarding Scientific Creativity,
- b) Data regarding Mathematical Creativity,
- c) Data regarding Entrepreneurial Creativity, and
- d) Data regarding Overall/General Creativity.

Data on scientific creativity was collected by administering the newly constructed Battery of Tests of Scientific Creativity; on mathematical creativity by utilising the specially developed Battery of Tests of Mathematical Creativity, and on Entrepreneurial Creativity by administering the newly constructed Battery of Tests of Entrepreneurial Creativity. Data on general/overall creativity (Verbal and Non-Verbal) was collected by utilising the MIER Tests of Creativity.

On Tests of Scientific Creativity, as many as six scores were derived. They were as follows :

- | | |
|-------------------------|------------------------------------|
| a) Fluency | b) Flexibility |
| c) Originality | d) Inventiveness |
| e) Productive Designing | f) Score on Scientific Creativity. |

On Tests of Mathematical Creativity, five scores given below were derived :

- | | |
|--------------------------------------|-------------------|
| a) Fluency | b) Flexibility |
| c) Originality | d) Transformation |
| e) Score on Mathematical Creativity. | |

On Tests of Entrepreneurial Creativity four scores were derived. They were as follows :

- | | |
|----------------|---|
| a) Fluency | b) Flexibility |
| c) Originality | d) Score on Entrepreneurial Creativity. |

On MIER Tests of Creativity, three scores were obtained. These were :

- | | |
|----|---|
| a) | Score on Verbal Creativity |
| b) | Score on Non-Verbal Creativity |
| c) | Score on ^{General} Overall (Non-Verbal and Verbal) Creativity. |

5.4. RESULTS

The scores obtained from the Batteries of Tests of Scientific, Mathematical Entrepreneurial and Overall Creativity were statistically treated, to compute descriptive statistics namely mean, median, mode, standard deviation skewness, kurtosis, P_{27} and P_{73} . The results have been reported in Tables 5.1, 5.2, 5.3, and 5.4 and in graphs numbered G 1 to G 17 given in the Appendix.

TABLE - 5.1

MEAN, MEDIAN, MODE, STANDARD DEVIATION, SKEWNESS, KURTOSIS P_{73} , P_{27}
(DIMENSION AND TOTAL SCORE WISE) ON THE BATTERY OF TESTS
OF SCIENTIFIC CREATIVITY. N = 600

DIMENSION	MEAN	MEDIAN	MODE	STANDARD DEVIATION	SKEWNESS	KURTOSIS	P_{27}	P_{73}
SCIENTIFIC CREATIVITY	12.80	13.00	13.00	4.35	.16	.18	10.00	15.00
MATHEMATICAL CREATIVITY	8.31	8.00	8.00	3.87	.54	.38	6.00	10.00
ENTREPRENEURIAL CREATIVITY	15.29	16.00	16.00	6.89	.20	.33	11.00	19.00
OVERALL CREATIVITY	23.39	21.00	.00	15.73	.66	.20	13.00	32.00
PRODUCTIVE THINKING	4.48	5.00	.00	4.12	1.25	4.14	.00	6.00
TOTAL SCORE SCIENTIFIC- MATHEMATICAL- ENTREPRENEURIAL- OVERALL CREATIVITY	64.34	63.00	54.00	25.41	.27	-.17	47.00	80.00

TABLE - 5.2

MEAN, MEDIAN, MODE, STANDARD DEVIATION, SKEWNESS, KURTOSIS, P_{27} AND P_{73}
(DIMENSION AND TOTAL SCORE WISE) ON THE BATTERY OF TESTS OF
MATHEMATICAL CREATIVITY (N = 600)

CREATIVITY DIMENSION	MEAN	MEDIAN	MODE	STANDARD DEVIATION	SKEWNESS	KURTOSIS	P_{27}	P_{73}
FLUENCY	11.042	11.000	10.000	4.530	2.432	22.065	8.00	13.00
FLEXIBILITY	8.297	8.000	8.000	4.187	1.859	13.026	6.00	10.00
ORIGINALITY	14.438	11.500	.000	12.259	1.429	3.333	6.00	21.00
TRANSFORMATION	26.602	25.00	24.000	13.506	.427	.327	19.000	35.00
TOTAL SCORE OF MATHEMATICAL CREATIVITY	60.282	58.000	63.000	24.720	.324	-.038	44.000	77.00

TABLE - 5.3

MEAN, MEDIAN, MODE, STANDARD DEVIATION, SKEWNESS, KURTOSIS, P_{27} AND P_{73}
(DIMENSION AND TOTAL SCORE WISE) ON THE BATTERY OF TESTS OF
ENTREPRENEURIAL CREATIVITY (N = 600)

CREATIVITY DIMENSION	MEAN	MEDIAN	MODE	STANDARD DEVIATION	SKEWNESS	KURTOSIS	P_{27}	P_{73}
FLUENCY	16.557	16.000	16.000	7.189	.177	-.331	11.000	21.00
FLEXIBILITY	12.862	13.000	12.000	6.938	.297	-.367	8.000	17.70
ORIGINALITY	15.688	14.000	14.000	11.394	1.153	1.675	8.000	20.00
TOTAL SCORE ON ENTREPRE- NEURAL CREATI- VITY.	45.055	44.000	40.000	23.051	.634	.581	29.000	58.00

TABLE - 5.4

MEAN, MEDIAN, MODE, STANDARD DEVIATION, SKEWNESS, KURTOSIS, P_{27} AND P_{73}
(TOTAL SCORE WISE) ON THE BATTERY OF TESTS OF OVERALL CREATIVITY
(VERBAL AND NON-VERBAL) (N = 600)

AREA	MEAN	MEDIAN	MODE	STANDARD DEVIATION	SKEWNESS	KURTOSIS	P_{27}	P_{73}
VERBAL CREATIVITY	53.602	53.000	70.000	24.708	.028	-.542	37.000	70.000
NON-VERBAL CREATIVITY	20.277	22.000	1.000	13.126	.372	.895	11.000	28.000
OVERALL CREATIVITY (VERBAL AND NON-VERBAL)	73.878	74.000	110.000	30.665	.080	-.273	50.540	95.000

5.5. DESCRIPTIVE DATA DISCUSSION OF RESULTS A. (SCIENTIFIC CREATIVITY)

The values of Mean, Median, Mode,
Standard Deviation, Skewness

Kurtosis, P_{27} and P_{73} in case of

the scores on the scientific creativity dimensions namely Fluency,
Flexibility, Originality, Inventiveness, Productive Designing
Ability and Scientific Creativity have been given in Table 5.1.

The histograms based on the distribution of scores on the different
dimensions of scientific creativity for 600 adolescents, have
been given in the Appendix.

All the frequency distributions on the different dimensions
of scientific creativity, are positively skewed. The extent of
skewness is small in case of Fluency and Originality; while it is
somewhat large in case of the dimensions viz; Flexibility and
Inventiveness. However, maximum skewness has been observed in
case of Productive Designing Ability.

An examination of the peakedness or kurtosis of the above
distributions shows that the distributions of the scores on
Fluency, Flexibility, Originality, Inventiveness productive

Designing Ability and Scientific Creativity are slightly leptokurtic. In other words, these distributions exhibit peakedness. The histogram based on the distribution of scores on Productive Designing Ability exhibits a bi-modal curve.

A study of the graphs reveals that the histograms in case of all the dimensions of scientific creativity viz; Fluency, Flexibility, Originality, Inventiveness, Productive Designing Ability and Scientific Creativity correspond to the shape of the normal probability curve.

The obtained results clearly show that scientific creativity, as measured by the Tests of Scientific Creativity, is a normally distributed ability. The observed deviations from normality can be attributed to,

- 1) Relatively small sample size,
- 2) Inherent errors in the measuring tool and
- 3) Built in errors in the scoring scheme.

Nonetheless, the conclusions arrived at, regarding the nature of creativity stand as aforesaid.

5.5.1 CONCLUSIONS

On the basis of the above discussion,
the following conclusions can be drawn :

- a) The scores on all the dimensions of Scientific Creativity viz; Fluency, Flexibility, Originality, Inventiveness, Productive Designing Ability and Scientific Creativity are by and large normally distributed. It can be concluded therefore, that scientific creativity as measured by the newly developed Battery of Tests of Scientific Creativity is an ability which is normally distributed in the population at the +2 level of education.
- b) Notwithstanding the slight positive skewness and the leptokurtic nature of the frequency distributions based on the scores on the various dimensions of scientific creativity it can be concluded that, if the data is collected on a larger

population, there is every possibility of getting a normal probability curve, for the scores on the different dimensions namely Fluency, Flexibility, Originality, Inventiveness Productive Designing Ability and Scientific Creativity for which scores can be obtained from the Tests of Scientific Creativity.

5.6 B. MATHEMATICAL CREATIVITY

The values of Mean, Median, Standard Deviation, Skewness, Kurtosis, P_{27} and P_{73} in case of the scores on the mathematical creativity dimensions, viz ; Fluency, Flexibility, Originality, Transformation and Mathematical Creativity have been given in Table 5.2. The distribution of scores have been graphically represented in graphs numbered from G 7 to G 12 respectively.

A study of the different distributions obtained in case of the scores on the different dimensions of mathematical creativity reveals that, all the curves, are positively skewed. The extent of skewness is largest (2.432) in case of the dimensions namely Fluency, followed by Flexibility (1.859) and Originality (1.429). The value of Skewness in the case of the total score on Mathematical Creativity and Transformation indicate only a slight positive skewness. Despite the fact that, the Kurtosis value in case of Fluency and Flexibility dimensions are relatively large, the histograms in both cases correspond to the shape of the normal probability curve. In the case of other dimensions, the extent of kurtosis is not very pronounced. It can therefore be presumed that, if the Tests of Mathematical Creativity are administered on a larger population the resulting distribution would by and large closely resemble a normal curve. On the basis of the analysis of the skewness and kurtosis values, it can be said that, the scores on the different dimensions of mathematical creativity viz; Fluency, Flexibility, Transformation, Originality and Mathematical Creativity, are normally distributed in the general population and that, creativity is measured by the newly developed Battery of Tests of Mathematical Creativity.

is a normally distributed ability.

5.6.1. CONCLUSIONS

On the basis of the above discussion,
the following conclusions can be drawn :

a) The scores on all the dimensions of Mathematical Creativity viz; Fluency, Flexibility, Originality, Transformation and Mathematical Creativity are distributed normally, in the general population and mathematical creativity as measured by the Battery of Tests of Mathematical Creativity is an ability which is normally distributed among the population at the +2 level of education.

b) Scores on the different creative abilities comprising Mathematical Creativity viz; Fluency, Flexibility, Originality, Transformation and Mathematical Creativity are also normally distributed among the population.

5.7. C. ENTREPRENEURAL CREATIVITY

Table 5.3 shows the values of Mean, Median, Mode, Standard Deviation,

Skewness, Kurtosis, P_{27} and P_{73} in the case of distribution of scores on the different dimensions of Entrepreneurial Creativity viz; Fluency, Flexibility, Originality and Entrepreneurial Creativity. The frequency distributions have been graphically represented in graphs numbering G 12 to G 13, respectively (given in appendix).

An analysis of the skewedness values obtained from the frequency distributions of scores on the dimensions namely Fluency, Flexibility, Originality and Entrepreneurial Creativity reveals only a slight positive skewness the largest value being 1.153 in case of Originality. The Kurtosis values though negative in the cases of Fluency and Flexibility are not significantly large. The same applies to the values of kurtosis in case of Originality and Entrepreneurial Creativity. Thus, no large deviations from

normality can be observed, and the distributions of scores, can be noticed from the graphical representations. Scores on all the four dimensions of Entrepreneurial Creativity are by and large normally distributed.

The probable reasons for the observed slight deviations from normality have been discussed earlier.

Thus, creativity as measured by the newly developed Battery of Tests of Entrepreneurial Creativity can be said to be a normally distributed ability among the population at the +2 stage of education.

5.7.1. CONCLUSIONS In the light of the above discussion the following conclusions can be crystallized :

a) Entrepreneurial Creativity as measured by the Battery of Tests of Entrepreneurial Creativity, is a normally distributed ability, among the adolescents studying at the +2 level of education. The score on creativity dimensions namely Fluency, Flexibility, Originality and Entrepreneurial Creativity are also by and large normally distributed in the population.

b) Notwithstanding the slight deviations from normality, it can be concluded that if data on the different dimensions of entrepreneurial creativity is collected on a larger sample, there is every possibility that the resulting graphical distributions will largely resemble the normal probability curve.

5.8. D. GENERAL CREATIVITY

The values of Mean, Median, Mode Standard Deviation,

Skewness Kurtosis, P_{27} and P_{73}

on Verbal Creativity, Non-Verbal Creativity and General Creativity, have been given in Table 5.4. The frequency distributions have been graphically represented in graphs number G 16 to G 18 respectively.

An analysis of the frequency distributions in the case of Verbal, Non-Verbal and Overall (general) Creativity reveals slight positive skewness. The extent of kurtosis, positive in case of Non-Verbal and negative in cases of Verbal and General Creativity is not large. An examination of the peakedness or kurtosis of the distribution of scores in the three areas, shows that these are leptokurtic in nature, and correspond to a large extent, to the shape of the normal probability curve. This implies that, the scores on Verbal, Non-Verbal and General Creativity can be considered to be normally distributed in the general population. It can safely be presumed that if the tests are administered on a larger population, the resulting distributions, would be very close to the normal probability curve. The results obtained are in line with the results obtained by Gupta (1975).

5.8.1. CONCLUSIONS On the basis of the discussion the following conclusions can be drawn :

- a) Verbal Creativity as measured by the MIER Tests of Verbal Creativity is a normally distributed ability.
- b) Non-Verbal Creativity as measured by the MIER Tests of Non-Verbal Creativity is an ability which is normally distributed in the population.
- c) Creativity (general) as measured by the Verbal and Non-Verbal Batteries of MIER Tests of Creativity happens to be a normally distributed ability. If data on a larger sample is collected, there is large likelihood of getting a frequency distribution closely resembling a normal probability curve.

COMPARISON OF SETS OF IDENTIFICATIONS YIELDED
BY NEWLY DEVELOPED BATTERIES WITH IDENTIFICA-
TION MADE THROUGH TESTS OF GENERAL CREATIVITY

5.9. INTRODUCTION After the identification of adolescents with (a) high and low Scientific Creativity, (b) high and low Entrepreneurial Creativity, (c) high and low Mathematical Creativity and (d) high and low General Creativity, it was considered essential to compare the individuals with high and low creativity identified on the basis of the three newly developed Batteries of Tests of Creativity with their relative status on the Battery of Tests of General Creativity. The idea was to ascertain if the two sets of identifications yielded by the two ^{different} measures of creativity show identical results or not. Such an exercise was also felt essential to test the justification of using separate tests of creativity to identify adolescents with high and low creativity in the fields of mathematics, science and commerce, even when they could be identified by using the tests of general creativity - some thing which has been the practice in the past.

For this purpose, 720 adolescents (divided into three groups of 240 each, from the fields of scientific, mathematical and commerce/^{entrepreneurial creativity} and sub-divided into sub-groups of 120 each on the basis of 'high' and 'low' scores on creativity) were compared with regards to their creativity status on the tests of general creativity.

5.10. RESULTS The results have been shown in Table 5.5, 5.6 and 5.7 respectively.

TABLE - 5.5

COMPARATIVE STATUS OF ADOLESCENTS WITH HIGH AND LOW
SCIENTIFIC CREATIVITY ON TESTS OF GENERAL CREATIVITY

SCIENTIFIC CREATIVITY

	High Creativity*	Low Creativity*	
High Creativity	33 (33)	33 (33)	66
Average Creativity	57 (55)	53 (55)	110
Low Creativity	30 (32)	34 (32)	64
	120	120 * $\chi^2 = .396$	240

* Adolescents whose scores were higher than the P_{73} value were categorized under the 'high creativity' group.

* Adolescents whose scores were lower than the P_{27} value were categorized under the 'low creativity' group.

* $\chi^2 = .396$

* The expected values of frequencies in each cell are given in the parenthesis.

TABLE - 5.6

COMPARATIVE STATUS OF ADOLESCENTS WITH HIGH AND LOW
ENTREPRENEURIAL CREATIVITY ON TESTS OF GENERAL CREATIVITY

ENTREPRENEURIAL CREATIVITY

	High Creativity*	Low Creativity*	
High Creativity	35 (33.5)	32 (33.5)	67
Average Creativity	54 (55.5)	57 (55.5)	111
Low Creativity	31 (31)	31 (31)	62
	120	120 * $\chi^2 = .216$	240

- * Adolescents whose scores were higher than the P_{73} value were categorised under the 'high creativity' group.
- * Adolescents whose scores were lower than the P_{27} value were categorised under the 'low creativity' group.
- * $\chi^2 = .216$
- * The expected value of frequencies in each cell are given in parenthesis.

TABLE - 5.7

COMPARATIVE STATUS OF ADOLESCENTS WITH HIGH AND LOW MATHEMATICAL CREATIVITY ON TESTS OF GENERAL CREATIVITY

	MATHEMATICAL CREATIVITY		
	High Creativity*	Low Creativity*	
High Creativity	30 (30)	30 (30)	60
Average Creativity	57 (55)	53 (55)	110
Low Creativity	33 (35)	37 (35)	70
	120	120	240

* $\chi^2 = .374$

- * Adolescents whose scores were higher than the P_{73} value were categorised under the 'high creativity' group.
- * Adolescents whose scores were lower than the P_{27} value were categorised under the 'low creativity' group.
- * $\chi^2 = .374$
- * The expected values of frequencies in each cell are given in parenthesis.

5.11. DISCUSSION OF RESULTS (SCIENCE GROUP)

Table 5.5 shows the comparative status of adolescents with high and low scientific creativity with

regard to general creativity. The results show that out of 120 students with high scientific creativity, only 33 have been identified as such on the basis of their scores on the tests of general creativity, while 57 adolescents have been categorised as ones with "average" creativity. Surprisingly, 25% i.e. 30 adolescents with high scientific creativity have been categorised as adolescents with "low" general creativity. Similarly, among the adolescents with "low" scientific creativity, as many as 33 have been labelled as adolescents with "high" general creativity while, 53 cases fall in the "average" general creativity category. Only 34 of the 120 adolescents are found in the "low" creativity group. Thus, out of 240 adolescents in the science stream, only 64 adolescents have been found to occupy the same status (high or low) on both measures of creativity.

In order to test whether the two tests yield independent identifications or not, Chi Square Test of Independence was employed. The results show that the value of Chi Square is not significant. In other words the two sets of identifications are independent of each other. in statistical terms and that the observed similarity in the identifications is only by chance.

The obtained results clearly show that the possibility of a particular adolescent to be identified as 'highly' creative in the field of science and also simultaneously to be identified as 'highly' creative in the field of general creativity is not very bright and that adolescents with high and low scientific creativity may not be identified as such with the help of tests of general creativity.

5.12. DISCUSSIONS OF RESULTS (COMMERCE GROUP)

Table 5.6 shows the comparative status of adolescents with high and low entrepreneurial

creativity, with regard to general creativity. The results show that out of 120 students with 'high' entrepreneurial creativity, only 35 have been identified as such on the basis of their scores on the tests of general creativity while, 54 adolescents have been categorized as ones with "average" creativity. Surprisingly, 25.83% i.e. 31 adolescents with high entrepreneurial creativity have been categorized as adolescents with "low" general creativity. Similarly, among the adolescents with "low" entrepreneurial creativity, as many as 32 have been labelled as adolescents with "high" general creativity while, 57 cases fall in the "average" general creativity category. Only 31 of the adolescents are found in the "low" creativity group. Thus, out of 240 adolescents in the commerce stream, 62 or 26% cases have been found to occupy the same status (high or low) on both measures of creativity.

In order to test whether the two tests yield independent identifications or not, Chi Square Test of Independence was employed. The results show that the value of Chi Square is not significant. In other words, the two sets of identifications are independent of each other in statistical terms and that the observed similarity in the identification is only attributed to chance factors.

The obtained results clearly show that the possibility of a particular adolescent identified as 'highly' creative in the field of commerce, to be identified as 'highly' creative in the field of general creativity is not very bright and that adolescents with high and low entrepreneurial creativity may not be identified as such with the help of Tests of General Creativity.

This also indicates ^{that} the two batteries measure some thing unique which may also have some elements in common. Nonetheless the need to use the newly developed battery to identify entrepreneurial creativity is amply highlighted from the comparison.

5.13. DISCUSSION OF RESULTS (MATHEMATICS GROUP)

Table 5.7 shows the comparative status of adolescents with high and low mathematical creativity

with regard to general creativity. The results show that out of 120 students with high mathematical creativity, only 30 or 25% have been identified as such on the basis of their scores on Tests of General Creativity, while 57% adolescents have been categorised as ones with "average" creativity. Surprisingly, 26.15% i.e. 33 adolescents with high mathematical creativity have been categorised as adolescents with "low" general creativity. Similarly, among the adolescents with "low" mathematical creativity, as many as 30 or 25% have been labelled as adolescents with "high" general creativity, while 53 cases fall in the "average" general creativity category. Only 37 or 31% of the 120 adolescents are found in the "low" creativity group. Thus out of 240 adolescents in the mathematics streams 70 or 29% adolescents have been found to occupy the same status (high or low) on both the measures of creativity under comparison.

In order to test whether the two tests yield independent identifications or not, Chi Square Test of Independence was employed. The results show that the value of Chi Square is not significant. In other words, the two sets of identifications are independent of each other in statistical terms and that the observed similarity in the identifications is only attributed to chance factors.

The obtained results clearly show that the possibility of a particular adolescent to be identified as 'highly' creative in the field of mathematics and also simultaneously to be identified as 'highly' creative in the field of general creativity is not very bright, and that adolescents with high and low mathematical creativity may not be identified as such with the help of tests of general creativity.

This also indicates that the two batteries measure something unique, which may also have some elements in common. Nonetheless, the need to use the newly developed battery to identify mathematical creativity is amply highlighted from the comparison.

5.14. COMPARISON OF THE SETS OF IDENTIFICATIONS : CONCLUSIONS

On the basis of the analysis of results, it can be concluded that, the tests of creativity specially constructed to identify creative adolescents in the field of mathematics, science, and commerce yield sets of identifications which are significantly different from the identifications yielded by the tests of general creativity. The obtained results show that, the Tests of General Creativity are likely to miss nearly seventy five percent of the adolescents at the +2 stage who would otherwise be identified as having high creativity in the fields of science, mathematics and commerce, by using special tests developed for the purpose. Not only this, the identifications of the adolescents as highly creative or low creative would be identical in only about 75% percent cases. Taken as a whole, this leads one to conclude that such trust or confidence cannot be placed on the Tests of General Creativity in the matters of identifying talented adolescents in diverse fields at the #2 level of education. This highlights the justification of developing new tests of creativity with a view to identifying adolescents with high scientific creativity, mathematical creativity, and entrepreneurial creativity and thereby departing from the convention of basing our judgement on the tests of general creativity.

CHAPTER SIX

PROFILE ANALYSIS OF ADOLESCENTS TALENTED
IN DIFFERENT FIELDS

6.1. PROFILE ANALYSIS; INTRODUCTION After the adolescents with high and low entrepreneurial, mathematical and scientific creativity were identified, the next step was to delineate and compare the profiles of adolescents with high and low creativity in the four fields of commerce, mathematics and science^{and general fields}. The present chapter describes the profiles analysis in terms of the selected psycho-social and educational variables.

6.2. PROFILE ANALYSIS : PROCEDURE In order to assess the status of the high and low creativity groups on the different psycho-social and educational variables, a wide selection of tools were administered on a sample of 960 adolescents studying in the Higher Secondary Previous and Higher Secondary Final Classes of the +2 institutions in Jammu City, as per details furnished in Chapter III. Data was collected over a period of four days lasting two hours on each day, in each of the Higher Secondary institutions in Jammu City. The collected data was scored with the help of the scoring keys and masterlists were prepared. Since the scoring procedure of the responses on Personality Word List for the delineation of self images from the Word List consisted of working out the frequencies of checking out of different adjectives by a particular group, scores in the conventional sense, could not be derived. On the other hand, qualitative analysis technique was utilised for delineating self images, procedure for which has been explained earlier. However, scores for the two groups were obtained on the following variables :

- i) Interpersonal Relations
- ii) Intelligence

- iii) Locus of Control
- iv) Self Initiated Activities (Things Done On Your Own Checklist)
- v) Overall/General Creativity (Verbal & Non-Verbal Creativity)
- vi) Academic Achievement
- vii) Study Habits

While ~~On~~^{on} Interpersonal Relations four sets of scores viz; Child-Parent Interpersonal Relations (CPIR), Teacher-Pupil Interpersonal Relations (TPIR), Siblings Interpersonal Relations (SIR) and Friends Interpersonal Relations (FIR), were obtained, in the case of Study. Habits, as many as nine sets of scores were obtained (Habits with Regard To Time And Duration, Habits With Regard To Mode Of Study, Habits With Regard To Preparation For Exams Habits With Regard To Classroom Study, Habits With Regard To Extra Reading, Habits With Regard To Planning Study, Habits With Regard To Memorization And Total Study Habits).

The investigators decided to compare the scores of the two groups of adolescents; one exhibiting high and the other exhibiting low levels on (a) Entrepreneurial Creativity (b) Scientific Creativity (c) Mathematical Creativity and (d) Overall/General Creativity. in statistical terms, rather than resorting to comparisons on adhoc basis. Significance of difference between the two contrasting groups were worked out, by utilising their mean scores on the different key variables. The results were interpreted in the light of the critical ratios obtained. For interpretation purposes, two-tailed valued were taken as the reference point. The results have been reproduced in Tables 6.1, 6.2, 6.3, and 6.4 respectively.

6.3. PROFILE ANALYSIS : RESULTS

A. Entrepreneurial Creativity.

TABLE - 6.1

SIGNIFICANCE OF DIFFERENCES BETWEEN THE MEANS OF THE
GROUPS WITH HIGH AND LOW ENTREPRENEURIAL CREATIVITY
ON : SELECTED VARIABLES

TEST / DIMENSION	GROUPS	NUMBER	MEAN	STANDARD DEVIATION	CRITICAL RATIO
CHILD PARENT INTERPERSONAL RELATIONS	MH	120	109.20	15.10	4.57**
	L	120	99.19	18.63	
TEACHER-PUPIL INTERPERSONAL RELATIONS	H	120	106.42	20.94	5.61**
	L	120	91.69	19.71	
SIBLINGS INTERPERSONAL RELATIONS	H	120	101.32	23.19	5.47**
	L	120	84.58	24.15	
FRIENDS INTERPERSONAL RELATIONS	H	120	102.00	36.43	4.45**
	L	120	82.72	30.47	
TOTAL INTERPERSONAL RELATIONS	H	120	414.02	74.61	5.88**
	L	120	357.77	73.56	
INTELLIGENCE	H	120	43.46	15.74	6.99**
	L	120	30.18	13.63	
LOCUS OF CONTROL	H	120	8.63	2.98	.06
	L	120	8.61	2.98	
THINGS DONE ON YOUR OWN CHECKLIST	H	120	24.57	8.20	5.57**
	L	120	18.65	8.24	
VERBAL CREATIVITY	H	120	67.00	25.11	5.15**
	L	120	49.46	27.56	
NON-VERBAL CREATIVITY	H	120	26.67	11.84	4.14**
	L	120	20.27	12.09	
OVERALL CREATIVITY	H	120	96.16	41.50	5.16**
	L	120	70.32	35.87	
ACHIEVEMENT	H	120	59.76	9.51	6.44**
	L	120	52.31	8.37	

HABITS WITH REGARD TO TIME AND DURATION	H	120	6.95	2.75	8.52**
	L	120	4.14	2.34	
HABITS WITH REGARD TO MODE OF STUDY	H	120	30.94	9.34	12.72**
	L	120	17.76	6.45	
HABITS WITH REGARD TO PREPARATION FOR EXAMS	H	120	8.89	2.78	7.27**
	L	120	6.37	2.59	
HABITS WITH REGARD TO CLASS ROOM STUDY	H	120	15.48	4.13	13.57**
	L	120	8.72	3.56	
HABITS WITH REGARD TO EXTRA READING	H	120	18.07	6.65	13.96**
	L	120	8.26	3.88	
HABITS WITH REGARD TO PLANNING THE STUDY	H	120	5.21	1.95	10.53**
	L	120	2.88	1.43	
HABITS WITH REGARD TO MEMORIZATION	H	120	1.84	1.08	4.39**
	L	120	1.00	1.80	
TOTAL STUDY STRATEGY	H	120	87.24	23.94	15.14**
	L	120	49.07	13.79	

H Means Higher Group

L Means Lower Group

** Significant Beyond .01
Level Of Confidence

6.4 DISCUSSION OF RESULTS

The results of the significance of differences between the means of groups with high and low entrepreneurial creativity on the selected key variables have been reported in Table 6.1. Out of the twenty critical ratios given, only one value (involving the scores on Locus of Control) is insignificant. All the other values are significant beyond .01 level of confidence. The following results can be crystallized from the table :

- 1) The adolescents with high entrepreneurial creativity have a significantly higher mean score on Child Parent's Interpersonal Relations (CPIR), than their counterparts with low entrepreneurial creativity.
- 2) The obtained results show a significant difference between adolescents with high and low entrepreneurial creativity on Teacher-Pupil Interpersonal Relations (TPIR), with the former group exhibiting a significantly superior TPIR.
- 3) Adolescents with high entrepreneurial creativity have a significantly higher mean score on Siblings-Interpersonal Relations (SIR), than their counterparts with low entrepreneurial creativity.
- 4) The obtained results show a significant difference between adolescents with high and low entrepreneurial creativity on Friends-Interpersonal Relations (FIR). with the former group exhibiting significantly superior FIR.
- 5) Significant difference exists in the mean scores of adolescents with high and low entrepreneurial creativity on Total Interpersonal Relations (TIR). The present results show that the mean overall interpersonal relation score of the highly creative group of adolescents is significantly higher than that of the group with low entrepreneurial creativity.
- 6) Adolescents with high entrepreneurial creativity have a significantly higher mean score on Intelligence than their counterparts with low entrepreneurial creativity. This indicates that adolescents with high entrepreneurial creativity also have a high level of Intelligence.
- 7) The difference between the mean scores of adolescents with high and low entrepreneurial creativity on Locus of Control is statistically insignificant. . . . It can therefore be said that, adolescents with high and low creativity in the field

of commerce, cannot be discriminated on the basis of their mean scores on Locus of Control.

8) The difference between the mean scores of the adolescents with high and low entrepreneurial creativity on Self-Initiated Activities (Things Done On Your Own Checklist) is statistically significant. This is indicated by the value of the critical ratio which is significant beyond .01 level of confidence. This shows that the adolescents with high entrepreneurial creativity initiate more activities on their own as compared to their counterparts with low creativity.

9) Adolescents with high entrepreneurial creativity have a significantly higher mean score on verbal creativity than the adolescents with low entrepreneurial creativity.

10) The difference between the mean scores of the adolescents with high and low entrepreneurial creativity on Non-Verbal Creativity is statistically significant ($P < .01$), with the former group having a significantly higher mean score than the latter.

11) Adolescents with high entrepreneurial creativity have a significantly higher mean score on overall/general creativity in comparison with their counterparts with low entrepreneurial creativity.

12) The difference between the mean scores of adolescents with high and low entrepreneurial creativity, with respect to academic achievement is statistically significant ($P < .01$). The results indicate that the adolescents with high entrepreneurial creativity also achieve significantly higher academically than their counterparts with low entrepreneurial creativity.

13) The difference between adolescents with high and low entrepreneurial creativity with regard to Habits Concerning Time and Duration of study is statistically significant ($P < .01$), with the former group showing a significantly superior habits concerning time and duration of study.

14) Adolescents with high entrepreneurial creativity have a significantly higher mean score on Habits With Regard To Mode of Study as compared to their counterparts with low entrepreneurial creativity.

15) Adolescents with high entrepreneurial creativity have a significantly higher mean score on Habits With Regard To Preparation For Exams, than their counterparts with low entrepreneurial creativity.

16) Adolescents with high entrepreneurial creativity differ significantly from their counterparts with low creativity on Habits With Regard to Classroom Study, with the former group having superior habits concerning classroom study.

17) Adolescents with high entrepreneurial creativity have a significantly higher mean score on Habits With Regard To Extra Reading than their counterparts with low entrepreneurial Creativity.

18) The results indicate that significant difference exists between the mean scores of pupils with high and low entrepreneurial creativity with reference to Habits Concerning Planning The Study. The former group plan their studies better than the latter group.

19) Adolescents with high entrepreneurial creativity differ significantly from ^{the} adolescents with low entrepreneurial creativity, with respect to Habits With Regard To Memorization. The former group exhibit superior strategies concerning memorization than ~~the~~ latter group.

20) Significant difference exists between the mean scores of adolescents with high and low entrepreneurial creativity on Study Habits as a whole, with the study habits of the former group being significantly superior to those of the adolescents with low entrepreneurial creativity.

6.5. PROFILE ANALYSIS OF ADOLESCENTS (COMMERCE GROUP) : CONCLUSIONS

In the light of the above discussion the following conclusions can be drawn :

- 1) Adolescents with high entrepreneurial creativity have significantly positive and healthy relationships with their parents, teachers, siblings and friends.
- 2) Adolescents with high entrepreneurial creativity show significantly higher achievement level than their counterparts with low entrepreneurial creativity.
- 3) Adolescents with a high creativity level in the field of commerce are capable of initiating more novel and interesting activities and completing them, than their counterparts with low creativity.
- 4) Adolescents with high entrepreneurial creativity have significantly higher general creativity levels both verbal and non-verbal. This indicates that, creativity of a particular type is not an isoteric ability limited only to a few. On the other hand, adolescents can be creative in several fields at the same time.
- 5) Adolescents with high entrepreneurial creativity, also possess a higher level of intelligence as compared to those with low entrepreneurial creativity.
- 6) Adolescents with high and low entrepreneurial creativity cannot be discriminated on the basis of their Locus of Control.

B. Scientific Creativity.

TABLE - 6.2.

SIGNIFICANCE OF DIFFERENCE BETWEEN THE MEANS OF THE
GROUPS WITH HIGH AND LOW SCIENTIFIC CREATIVITY ON
SELECTED VARIABLES

TEST / DIMENSION	GROUPS	NUMBER	MEAN	STANDARD DEVIATION	CRITICAL RATIO
CHILD PARENT INTERPERSONAL RELATIONS	H	120	109.83	12.25	4.15**
	L	120	99.04	25.74	
TEACHER PUPIL INTERPERSONAL RELATIONS	H	120	106.25	18.01	4.64**
	L	120	92.01	28.38	
SIBLINGS INTERPERSONAL RELATIONS	H	120	103.59	15.75	6.85**
	L	120	82.86	29.19	
FRIENDS INTERPERSONAL RELATIONS	H	120	97.47	26.44	5.00**
	L	120	79.58	28.89	
TOTAL INTERPERSONAL RELATIONS	H	120	416.47	54.11	6.97**
	L	120	354.48	81.01	
INTELLIGENCE	H	120	67.22	14.82	9.80**
	L	120	49.81	12.63	
FOCUS OF CONTROL	H	120	7.37	3.03	1.19
	L	120	7.87	3.56	
THINGS DONE ON YOUR OWN CHECKLIST	H	120	17.44	7.10	2.66*
	L	120	15.11	6.47	
VERBAL CREATIVITY	H	120	73.03	76.35	1.15
	L	120	64.32	32.36	
NON-VERBAL CREATIVITY	H	120	28.23	11.12	2.35*
	L	120	23.99	16.36	
OVERALL CREATIVITY	H	120	94.10	31.66	1.16
	L	120	88.67	40.52	
ACHEVEMENT	H	120	76.47	15.32	10.05**
	L	120	65.11	11.19	

HABITS WITH REGARD TO TIME AND DURATION	H	120	5.73	2.26	4.31**
	L	120	4.44	2.39	
HABITS WITH REGARD TO MODE OF STUDY	H	120	22.99	8.58	8.93**
	L	120	14.79	5.24	
HABITS WITH REGARD TO PREPARATION FOR EXAMINATION	H	120	8.52	4.33	3.80**
	L	120	6.80	2.45	
HABITS WITH REGARD TO CLASSROOM STUDY	H	120	12.89	5.21	7.42**
	L	120	8.27	4.38	
HABITS WITH REGARD TO EXTRA READING	H	120	13.78	6.02	10.14**
	L	120	7.17	3.85	
HABITS WITH REGARD TO PLANNING THE STUDY	H	120	4.80	2.79	4.83**
	L	120	2.17	2.40	
HABITS WITH REGARD TO MEMORIZATION	H	120	1.65	1.09	.32
	L	120	1.58	2.01	
TOTAL STUDY STRATEGY	H	120	70.84	18.72	12.56**
	L	120	45.87	11.13	

H Means Higher Group

L Means Lower Group

** Significant Beyond .01 Level of Confidence

6.6. DISCUSSION OF RESULTS

The results of the significance of differences between the means of groups with high and low Scientific Creativity on the selected key variables have been reported in table 6.2. Out of the twenty critical ratios given, four values (involving the scores on Locus of Control, Overall creativity, Verbal Creativity and Habits With Regard To Memorization) are insignificant.

As many as fourteen values are significant beyond .01 level and two values are significant beyond .05 level of confidence. The following results can be crystallized from the Table :

- 1) The adolescents with high scientific creativity have a significantly higher mean score on Child-Parent's Interpersonal Relations (CPIR), than the adolescents with low scientific creativity.
- 2) A significant difference has been found to exist between the adolescents with high and low scientific creativity on Teacher-Pupil Interpersonal Relations (TPIR) with the former group exhibiting a significantly superior TPIR.
- 3) Adolescents with high scientific creativity have a significantly higher mean score on Siblings-Interpersonal Relations (SIR), than their counterparts with low scientific creativity.
- 4) A significant difference has been found between the mean score of adolescents with high and low scientific creativity on Friends Interpersonal Relations (FIR) with the former group exhibiting significantly superior FIR.
- 5) The mean scores of adolescents with high and low scientific creativity differ significantly with regards to Total Interpersonal Relations (TIR). The present results show that the mean overall interpersonal relation score of the adolescents with high scientific creativity is significantly higher than that of the group with low scientific creativity.
- 6) Adolescents with high creativity level in the field of science have a significantly higher mean score on Intelligence, than their adolescents with low scientific creativity. This indicates that adolescents with high scientific creativity also possess a high level of Intelligence.
- 7) The difference between the mean scores of adolescents with high and low scientific creativity on Locus of Control is

statistically insignificant. It can therefore be said that the two groups of adolescents one exhibiting high and the other low scientific creativity cannot be discriminated on the basis of their mean scores on Locus of Control.

8) The difference between the mean scores of the adolescents with high and low scientific creativity on Self-Initiated Activities (Things Done On Your Own) is statistically significant beyond .01 level of confidence. It can be inferred, therefore that, adolescents with high scientific creativity are more capable of initiating unique and interesting activities and completing them on their own as compared to their counterparts with low scientific creativity.

9) No significant difference has been found to exist between the mean scores of adolescents with high and low scientific creativity on the basis of their Verbal Creativity level. It can thus be said that adolescents with high and low creativity in the field of science cannot be discriminated on the basis of their Verbal Creativity scores. This is a significant finding in that adolescents with high creativity in science have not simultaneously attained high mean scores on verbal creativity.

10) The difference between the mean scores of the adolescents with high and low scientific creativity on Non-Verbal Creativity is significant ($P < .05$), with the former group having a significantly higher mean score than the latter. Thus adolescents with high scientific creativity have been found to have high non-verbal creativity.

11) No significant difference has been found to exist between the mean scores of adolescents with high and low scientific creativity on general creativity. The results indicate that the two groups of adolescents cannot be discriminated on the basis of their ^{mean} general creativity level. This is again a very significant finding and supports the hypothesis of the investigators that tests of general creativity may not differentiate

between adolescents endowed with high and low scientific creativity.

12) The difference between the mean scores of adolescents with high and low scientific creativity, with respect to academic achievement is statistically significant ($P < .01$). This indicates that the adolescents with high creativity^{achieve} significantly higher academically than their counterparts with low scientific creativity.

13) The group of adolescents with high scientific creativity has been found to exhibit significantly superior Habits Concerning Time and Duration of Study as compared to the adolescents with low scientific creativity ($P < .01$).

14) Adolescents with high scientific creativity have significantly superior Habits Concerning Mode of Study as compared to their counterparts with low scientific creativity ($P < .01$).

15) Adolescents with high scientific creativity, have a significantly higher mean score on Habits Concerning Preparation for Examinations as compared to the adolescents with low scientific creativity ($P < .01$).

16) Adolescents with high creativity in the field of science differ significantly from the adolescents with low scientific creativity on Habits With Regard To Classroom Study with the former group having significantly superior classroom study habits ($P < .01$).

17) Adolescents with high scientific creativity have a significantly higher mean score on Habits With Regard To Extra Reading than their counterparts with low scientific creativity. ($P < .01$)

18) The mean scores of adolescents with high and low scientific creativity with regard to Habits Concerning Planning The Study have been found to differ significantly with the former

group having significantly superior study planning habits than the latter.

19) No significant difference has been found to exist between the mean scores of adolescents with high and low scientific creativity with regard to Habits Concerning Memorization. The results show that adolescents with high and low scientific creativity cannot be discriminated on the basis of their Habits With Regard To Memorization.

20) The overall study habits of adolescents with high and low scientific creativity differ significantly from each other, with the study habits of the former group being significantly superior to the adolescents with low scientific creativity.

6.7. PROFILES OF ADOLESCENTS WITH HIGH AND LOW SCIENTIFIC CREATIVITY : CONCLUSIONS

In the light of the above discussion the following conclusions can be crystallized regarding the profiles of adolescents with high and low scientific creativity :

- 1) Adolescents with high scientific creativity have significantly superior, positive and healthy relationships with their parents, teachers, siblings and friends as compared to the adolescents with low scientific creativity.
- 2) Adolescents with high scientific creativity possess a higher level of intelligence as compared to those with low scientific creativity.
- 3) The adolescents with high and low scientific creativity cannot be discriminated on the basis of their mean levels of Locus of Control.
- 4) The adolescents with high and low scientific creativity cannot be discriminated on the basis of their Verbal Creativity Levels. This happens to be a significant finding which supports

the hypothesis of the investigators that traditional tests of general creativity having high verbal content may not ^{adequately} differentiate between adolescents endowed with ^{high} scientific creativity.

- 5) Adolescents with high creativity in the field of science, have a significantly superior Non-Verbal Creativity level than their counterparts with low creativity in the field of science.
- 6) Adolescents with high and low scientific creativity cannot be discriminated on the basis of their General Creativity Levels. This is again a very significant finding which supports the hypothesis of the investigators regarding the need to develop specific tests for measuring creativity in the field of science.
- 7) Adolescents with high scientific creativity are more capable of initiating unique, novel, interesting and different activities and completing them, as compared to the adolescents with low scientific creativity. This is a significant finding which supports the findings of Torrance regarding the activities initiated by the creative children.
- 8) Adolescents with high scientific creativity show significantly higher achievement level in comparison to their counterparts with low scientific creativity.
- 9) The study habits (as a whole), of the adolescents with high scientific creativity, are superior when compared to the study habits of the adolescents with low scientific creativity. The only case where the difference between the two groups of adolescents have not been found significant ^{is} with regard to their Habits Concerning Memorization.

TABLE - 6.3

SIGNIFICANCE OF DIFFERENCE BETWEEN THE MEANS OF THE
GROUPS WITH HIGH AND LOW MATHEMATICAL CREATIVITY ON
SELECTED VARIABLES

TEST / DIMENSION	GROUPS	NUMBER	MEAN	STANDARD DEVIATION	CRITICAL RATIO
CHILD PARENT INTERPERSONAL RELATIONS	H	120	101.53	14.45	1.66
	L	120	97.55	21.88	
TEACHER PUPIL INTERPERSONAL RELATIONS	H	120	99.98	16.45	1.19
	L	120	96.93	22.82	
SIBLINGS INTERPERSONAL RELATIONS	H	120	95.48	22.02	1.57
	L	120	90.80	23.96	
FRIENDS INTERPERSONAL RELATIONS	H	120	91.42	28.11	1.27
	L	120	86.77	28.41	
TOTAL INTERPERSONAL RELATIONS	H	120	388.53	60.27	1.76
	L	120	372.38	80.33	
INTELLIGENCE	H	120	67.92	14.23	13.98**
	L	120	42.36	14.09	
LOCUS OF CONTROL	H	120	8.66	2.90	1.85
	L	120	7.94	3.10	
THINGS DONE ON YOUR OWN CHECKLIST	H	120	19.30	9.42	.16
	L	120	19.11	9.55	
VERBAL CREATIVITY	H	120	58.21	20.10	4.32**
	L	120	46.01	23.54	
NON-VERBAL CREATIVITY	H	120	21.47	10.86	3.46**
	L	120	16.19	12.67	
OVERALL CREATIVITY	H	120	79.67	24.01	5.32**
	L	120	61.72	27.62	
ACHIEVEMENT	H	120	80.44	14.55	7.21**
	L	120	68.42	11.78	

HABITS WITH REGARD TO MODE AND DURATION	H	120	5.81	2.40	4.87**
	L	120	4.29	2.43	
HABITS WITH REGARD TO MODE OF STUDY	H	120	21.23	7.14	2.66*
	L	120	18.64	7.92	
HABITS WITH REGARD TO PREPARATION FOR EXAMS	H	120	8.30	3.71	3.18**
	L	120	6.96	2.76	
HABITS WITH REGARD TO CLASSROOM STUDY	H	120	11.64	4.52	2.84*
	L	120	9.95	4.71	
HABITS WITH REGARD TO EXTRA READING	H	120	10.90	5.46	3.07**
	L	120	8.86	4.81	
HABITS WITH REGARD TO PLANNING THE STUDY	H	120	3.93	1.68	.18
	L	120	3.89	1.86	
HABITS WITH REGARD TO MEMORIZATION	H	120	1.48	.98	1.16
	L	120	1.33	1.02	
TOTAL STUDY STRATEGY	H	120	63.97	15.32	4.85**
	L	120	53.93	16.88	

H Means Higher Group

L Means Lower Group

* Significant beyond .05 Level of confidence

** Significant beyond .01 level of confidence.

6.8. DISCUSSION OF RESULTS

The results of the significance of difference between the means of groups with 'high' and 'low' mathematical creativity on the selected key variables have been reported in table 6.3. Out of the twenty critical

ratios reported as many as eleven values are statistically significant. The following results can be crystallized from the table ..

1.) No significant difference exists between adolescents with high and low Mathematical Creativity, with regard to Child-Parent's Interpersonal Relations. This is indicated by the value of the critical ratio which is statistically insignificant. It can thus be said that adolescents with high and low mathematical creativity, cannot be discriminated on the basis of their scores on Child-Parents Interpersonal Relations (CPIR). However the value of the Critical Ratio is large enough to derive symptomatic conclusion. Thus, it can be hypothesized that there is every likelihood that the CPIR of adolescents with 'high' Mathematical Creativity would be somewhat superior to their counterparts with low' Mathematical Creativity.

2) The value of the critical ratio computed between the mean scores of adolescents with high and low Mathematical Creativity on Teacher-Pupil Interpersonal Relations is insignificant. This indicates that, the two groups of adolescents, one exhibiting high and the other low creativity in the field of mathematics, cannot be statistically discriminated on the basis of their scores on Teacher Pupil Interpersonal Relations (TPIR).

3) The results show that there is no significant difference between the adolescents with high and low Mathematical Creativity, with regard to the Siblings Interpersonal Relations. It can thus be said that the adolescents with high and low mathematical creativity cannot be discriminated on the basis of their scores on Siblings Interpersonal Relations (SIR). Nonetheless there are some indications that the SIR of the adolescents with high mathematical creativity are likely to be somewhat superior to their counterparts with low mathematical creativity.

4) The value of the critical ratio between the mean scores of adolescents with high and low mathematical creativity, on

Friends Interpersonal Relations is insignificant. This shows that the adolescents with high and low creativity in mathematics, cannot be discriminated on the basis of their scores on Friends Interpersonal Relations (FIR).

5) No significant difference have been found to exist between adolescents with high and low mathematical creativity with regard to Total Interpersonal Relations. The results indicate that, the adolescents with high and low mathematical creativity cannot be discriminated on the basis of their scores on Total Interpersonal Relations (TIR). Nonetheless symptomatic conclusions can be drawn since the value of the CR is large enough to be totally disregarded. Accordingly, there is likelihood that the ~~TERR~~ of the adolescents with high mathematical creativity would be somewhat superior to their counterparts with low mathematical creativity.

6) Adolescents with high mathematical creativity have a significantly higher mean score on Intelligence, than their counterparts with low mathematical creativity. This indicates that, adolescents with high creativity in the field of mathematics, also have a considerably high level of Intelligence.

7) The difference between the mean scores of adolescents with high and low mathematical creativity on Locus of Control is statistically insignificant. It can therefore be said that, adolescents with high and low creativity in the field of mathematics, cannot be discriminated on the basis of their mean scores on Locus of Control. However, the value of the CR is large enough to be of symptomatic importance. Accordingly it can be said that the adolescents with high mathematical creativity are likely to have an internal locus of control as compared to their counterparts with low mathematical creativity.

8) The difference between the adolescents with high and low mathematical creativity on self Initiated Activities (Things

Done On Your Own Checklist) is statistically insignificant. The two groups of adolescents thus, cannot be discriminated on the basis of their Self-Initiated Activities.

8) Adolescents with high mathematical creativity have a significantly higher mean score on Verbal Creativity, than their counterparts with low Verbal Creativity.

9) Significant difference exists between the mean scores of the adolescents with high and low mathematical creativity, on Non-Verbal Creativity, with the former group having a higher mean score than the latter.

10) Adolescents with high mathematical creativity have a significantly higher mean score on general creativity in comparison with their counterparts with low mathematical creativity.

11) Significant difference have been found to exist between the mean scores of the adolescents with high and low mathematical creativity with respect to Academic Achievement. The results indicate that, adolescents with high mathematical creativity also achieve significantly higher than their counterparts with low mathematical creativity.

12) Adolescents with high mathematical creativity have been found to achieve significantly higher than the adolescents with low mathematical creativity, with regard to Habits Concerning Time and Duration of Studied. Thus, the former group has been found to possess superior habits with regard to time and duration of study.

13) Significant difference has been found to exist between the adolescents with high and low mathematical creativity on Habits With Regard To Mode Of Study, with the former group having a significantly higher means score. Thus the mode of study of the adolescents with high mathematical creativity is superior to their counterparts.

15) Adolescents with high mathematical creativity have significantly superior Habits With Regard To Preparation For Examinations than their counterparts with low mathematical creativity

16) The mean score of the adolescents with high mathematical creativity is significantly higher than that of adolescents with low mathematical creativity with respect to Habits Concerning Classroom Study With the former group having significantly superior classroom study habits.

17) Adolescents with high mathematical creativity have a significantly higher mean score on Habits With Regard To Extra Reading as compared to the adolescents with low mathematical creativity.

18) The value of the critical ratio between the mean scores of the adolescents with high and low mathematical creativity on Habits With Regard To Planning The Study is statistically insignificant. This indicates that the two groups of adolescents cannot be discriminated on the basis of their Habits With Regard To Planning The Study.

19) No significant difference exists between the adolescents with high and low mathematical creativity with regard to Habits Concerning Memorization. This shows that ^{the}adolescents with high and low mathematical creativity cannot be discriminated on the basis of their strategies of memorization.

20) Significant difference has been found to exist between the adolescents with high and low mathematical creativity with regard to their Overall Study Habits. The results show that the adolescents with high mathematical creativity have significantly superior Study Habits as compared to their counterparts with low mathematical creativity.

6.9. PROFILES OF ADOLESCENTS WITH HIGH AND LOW MATHEMATICAL CREATIVITY : CONCLUSIONS

In the light of the above discussion, the following conclusions emerge regarding the profiles of adolescents

with high and low mathematical creativity :

- 1) Adolescents with high and low mathematical creativity cannot be differentiated on the basis of their Relations with their parents, teachers, siblings and friends and total interpersonal relations. At the same time, there are some indications to suggest that adolescents with high mathematical creativity are likely to have somewhat superior overall interpersonal relations.
- 2) The level of intelligence is considerably higher among adolescents with high mathematical creativity in comparison with the adolescents with low mathematical creativity.
- 3) The adolescents with high and low mathematical creativity cannot be discriminated on the basis of their Locus Of Control even though the present results do suggest that the former group of adolescents are likely to have somewhat internal Locus of Control.
- 4) The adolescents with high and low creativity levels in the stream of mathematics cannot be discriminated on the basis of Self-Initiated Activities (Things Done On Your Own Checklist). Such activities do not seem to interest adolescents studying mathematics.
- 5) Adolescents with high mathematical creativity have high general creativity levels both Verbal and Non-Verbal. This is indicative of the fact that adolescents with high mathematical creativity are also adolescents high on general creativity.
- 6) The adolescents with high mathematical creativity have a significantly higher achievement level as compared to their counterparts with low mathematical creativity.

7) Adolescents with high mathematical creativity have been found to exhibit significantly superior overall study habits as compared to their counterparts with low mathematical creativity. At the same time, these groups could not be differentiated on the basis of strategies for memorization and planning with regard to study.

TABLE - 6.4

SIGNIFICANCE OF DIFFERENCE BETWEEN THE MEANS OF THE
GROUPS WITH HIGH AND LOW OVERALL CREATIVITY ON
SELECTED VARIABLES

TEST / DIMENSION	GROUPS	NUMBER	MEAN	STANDARD DEVIATION	CRITICAL RATIO
CHILD PARENT INTERPERSONAL RELATIONS	H	120	106.46	15.40	5.31**
	L	120	94.78	18.53	
TEACHER PUPIL INTERPERSONAL RELATIONS	H	120	107.40	22.28	7.48**
	L	120	86.12	21.80	
SIBLINGS INTERPERSONAL RELATIONS	H	120	99.10	22.26	5.47**
	L	120	83.17	22.88	
FRIENDS INTERPERSONAL RELATIONS	H	120	97.31	23.84	4.74**
	L	120	81.48	27.72	
TOTAL INTERPERSONAL RELATIONS	H	120	410.43	66.46	7.12**
	L	120	346.41	72.62	
INTELLIGENCE	H	120	50.73	14.79	9.13**
	L	120	31.49	17.72	
LOCUS OF CONTROL	H	120	8.13	2.59	1.00
	L	120	7.76	3.17	
THINGS DONE ON YOUR WON CHECKLIST	H	120	18.63	8.57	-.21
	L	120	18.84	7.49	
ACHIEVEMENT	H	120	64.03	11.45	7.43**
	L	120	54.82	7.28	
HABITS WITH REGARD TO TIME AND DURATION	H	120	7.26	2.99	8.92**
	L	120	4.23	2.23	
HABITS WITH REGARD TO MODE OF STUDY	H	120	31.25	12.39	12.13**
	L	120	15.57	6.87	

BITS WITH CARD TO SEPARATION R EXAMINA- ON	H	120	9.02	3.11	8.98**
	L	120	5.76	2.49	
BITS WITH CARD TO CLASSROOM STUDY	H	120	14.41	5.65	11.70**
	L	120	7.36	3.41	
BITS WITH CARD TO STORY READING	H	120	16.49	7.87	9.62**
	L	120	8.48	4.61	
BITS WITH CARD TO PLANNING THE STUDY	H	120	4.90	2.24	10.25**
	L	120	2.40	1.46	
BITS WITH CARD TO MEMORIZATION	H	120	1.77	1.16	3.97**
	L	120	1.00	1.80	
TOTAL STUDY STRATEGY	H	120	85.62	31.50	12.73**
	L	120	44.67	15.80	

H Means Higher Group

L Means Lower Group

** Significant beyond .01
Level of Confidence.

DISCUSSION OF RESULTS

The significance of differences between the means of groups with high and low overall creativity on the selected key variables have been reported in table 6.4 . Out of the 20 critical ratios reported, fifteen values are significant beyond .01 level of confidence. The results indicate that there are genuine differences between adolescents with 'high' and 'low' overall creativity with respect to the different psycho-social and academic variables. The following results can be crystalized from the Table :

- The adolescents with high general creativity have a significantly higher mean score on Child-Parent's Interpersonal Relations (CPIR). than the adolescents with low general creativity.

- 2) Significant difference has been found to exist between the adolescents with high and low general creativity with respect to Teacher-Pupil Interpersonal Relations (TPIR), with the former group exhibiting significantly superior TPIR.
- 3) Adolescents with high general creativity have a significantly higher mean score on Siblings Interpersonal Relations (SIR) than their counterparts with low general creativity.
- 4) A significant difference has been found to exist between the mean scores of adolescents with high and low general creativity on Friends Interpersonal Relations (FIR), with the former group exhibiting significantly superior FIR.
- 5) The mean scores of adolescents with high and low general creativity differ significantly with regard to Total Interpersonal Relations (TIR). The results show that the mean Overall Interpersonal Relations score of the adolescents with high overall creativity, is significantly higher than that of the group with low general creativity.
- 6) The adolescents with high general creativity have a significantly higher mean score on Intelligence than the adolescents with ~~low~~ general creativity. This indicates that adolescents with high general creativity also possess a high level of Intelligence.
- 7) The difference between the mean scores of adolescents with high and low general creativity on Locus of Control is statistically insignificant. The results indicate that the adolescents with high and low general creativity cannot be differentiated on the basis of their Locus of Control.
- 8) The difference between the mean scores of adolescents with high and low general creativity on Self-Initiated Activities (Things Done On Your Own Checklist) is statistically insignificant. This shows that the adolescents with high and low general

creativity cannot be differentiated on the basis of activities initiated by them (Self-Initiated Activities).

9) A significant difference has been found to exist between the mean scores of the adolescents with high and low general creativity with respect to academic achievement. This indicates that ^{the} adolescents with high general creativity also achieve significantly higher than the adolescents with low general creativity.

10) Adolescents with high general creativity have been found to possess significantly superior Habits With Regard To Time And Duration of study than the adolescents with low general creativity.

11) A significant difference has been found to exist between the adolescents with high and low general creativity on Habits With Regard To Mode of Study, with the former group having a significantly higher mean score. Thus, the mode of study of the highly creative adolescents can be said to be superior to those of their counterparts with low creativity.

12) Adolescents with high general creativity have significantly superior Habits With Regard To Preparation For Examinations than their counterparts with low general creativity ($P < .01$).

13) The mean score of the adolescents with high general creativity has been found to be significantly higher than that of the adolescents with low general creativity with respect to Habits Concerning classroom study. This indicates that adolescents with high general creativity have significantly superior Classroom Study Habits.

14) A significant difference has been found to exist between the mean scores of adolescents with high and low general creativity with regard to Habits Concerning Extra Reading with

the former group exhibiting a significantly higher mean score.

15) The mean score of adolescents with high general creativity is significantly higher than that of the adolescents with low general creativity on Habits Concerning Planning The Study. The results indicate that the adolescents with high general creativity plan their studies much better than their counterparts with low general creativity.

16) The adolescents with high general creativity have significantly superior Habits With Regard To Memorization as compared to their counterparts with low general creativity ($P < .01$).

17) The mean score on Study Habits (as a whole), of the adolescents with high general creativity is significantly higher than the mean score of the adolescents with low overall creativity. The results show that the Study Habits of the adolescents with high general creativity are significantly superior to those of the adolescents with low general creativity.

PROFILES OF ADOLESCENTS WITH HIGH AND LOW GENERAL CREATIVITY : CONCLUSIONS

In the light of the above discussion, the following conclusions can be crystallized regarding the profiles of

adolescents with high and low general creativity :

1) The adolescents with high general creativity have significantly superior, positive and healthy relationships with their parents, teachers, friends and siblings, as compared to the adolescents with low overall creativity.

2) Adolescents with high general creativity possess a higher level of intelligence as compared to those with low general creativity.

3) The adolescents with high and low general creativity cannot be differentiated on the basis of their Locus of Control.

- 4) The difference between the adolescents with high and low general creativity on Self-Initiated Activities (TDOYOC) is statistically insignificant. The results show that the two groups of adolescents cannot be differentiated on the basis of their Self-Initiated Activities. It can be concluded that such types of activities do not differentiate between the adolescents with high and low general creativity.
- 5) The adolescents with high general creativity have a significantly higher achievement level as compared to the adolescents with low general creativity.
- 6) The adolescents with high general creativity have been found to possess significantly superior Study Habits in comparison to their counterparts with low general creativity.

6.12. SELF-IMAGES OF ADOLESCENTS
WITH HIGH AND LOW MATHEMATICAL
ENTREPRENEURAL, SCIENTIFIC AND
OVERALL CREATIVITY

In addition to analyzing
the differences between
the mean scores of adoles-
cents with high and low

Entrepreneurial, Scientific, Mathematical and Overall Creativity
on the variables viz; Interpersonal Relations (CPIR, TPIR, SIR,
FIR and TIR), Intelligence Locus of Control, Study Habits
(Eight dimensions), Verbal Creativity, Non-Verbal Creativity
and Overall/General Creativity, the investigators also deline-
ated their profiles in terms of their Self-Images for which
the Personality Word List (PWL), prepared by Deo had been
administered. The scoring for the PWL was done by
employing the 'qualitative analysis technique' explained earlier.

6.13. A. SELF-IMAGES OF ADOLESCENTS
WITH HIGH AND LOW ENTREPRENEURAL
CREATIVITY: RESULTS

The results obtained from
the analysis of the responses
of adolescents with high
and low entrepreneurial

creativity to the PWL have been reported in Table 6.5 given
below :

TABLE - 6.5

PERCEIVED SELF-IMAGES OF ADOLESCENTS IDENTIFIED AS HIGH
AND LOW ON ENTREPRENEURAL CREATIVITY

HIGH GROUP N = 120		LOW GROUP N = 120	
ADJECTIVES	* PERCENTAGE OF RESPONSES	ADJECTIVES	* PERCENTAGE OF RESPONSES
Active	58%	Contented	55%
Confident	58%	Simple	53%
Clear Thinking	57%	Affectionate	53%
Practical	55%	Excitable	52%
Sensitive	55%	Conventional	50%
Systematic	50%	Awkward	48%
Self-Controlled	48%	Persevering	47%
Frank	47%	Reserved	42%
Bold	42%	Cheerful	35%
Atheist	35%	Modest	32%
Modest	25%	Serious	25%

* Adjectives checked out by less
than 25% adolescents in the
population have not been
included here.

* Adjectives checked out by less
than 25% adolescents in the
population have not been
included here.

6.14. DISCUSSION OF RESULTS

Table^{6.5} shows the percentage of checking out of different adjectives in the Personality Word List, by 25% and more of the groups of adolescents with high and low entrepreneurial creativity. From this Table it is possible to compare as to which adjectives in the PWL have been checked out more frequently by the two groups of adolescents to get an idea of their perceived Real Self-Images.

The results show that the adolescents with high entrepreneurial creativity, describe themselves in terms of the adjectives namely, 'Active', 'Confident', 'Clear-Thinking', 'Practical', 'Sensitive', 'Systematic', 'Self-Controlled', 'Frank', 'Bold', 'Atheist' and 'Modest'.

The adjectives checked out by 50% and more adolescents in the highly creative group are ; sensitive, 'Systematic', 'Practical', 'Clear Thinking' and 'Confident' with maximum adolescents checking out the adjective viz ; Active (58%).

The adolescents with low entrepreneurial creativity, on the contrary, rate themselves as 'Contented', 'Simple', 'Affectionate', 'Excitable', 'Conventional', 'Awkward', 'Persevering', 'Reserved', 'Cheerful', 'Modest' and 'Serious'.

More than 50% adolescents with low creativity have checked out the adjectives viz; 'Conventional', 'Excitable', 'Affectionate' . . 'Simple' and with the maximum percentage checking out the adjective 'Contented' (55%).

The present results clearly show that most of the adjectives, characteristic of adolescents with high entrepreneurial creativity, are those which are associated with higher creativity level as reported by Torrance (1962) Barron (1968) & Gupta (1975) preference of the highly creative adolescents for dynamic and forceful adjectives. indicates that the highly creative possess more energy and vitality in them.

An unusual feature of the results which can be highlighted with regards to the adolescents with high entrepreneurial creativity is the checking out of the adjective viz ; 'Atheist' by 35% adolescents. One probable explanation for this apparent deviation from the conventional and conditioned way of thinking in Indian society could be that the highly creative adolescents are self-sufficient, autonomous, possessing high ego-strength and significant individuality. Therefore they do not believe in an omniscient, omnipotent and supertranscendental being - the shaper of destinies.

One adjective 'Modest' is found common in the self-images of the adolescents with high and low entrepreneurial creativity, eventhough the former group perceive themselves as comparatively less 'Modest'. This may be due to a self-awareness on the part of adolescents about their superior qualities of 'head' and creativity. At the same time, an adolescent child in our family situations is still practically dependent upon the parents and their 'modesty' may be explained as a realistic self-assessment.

In sharp contrast to their highly creative counterparts, the adolescents with low entrepreneurial creativity have described themselves in terms of adjectives which are passive, inactive, submissive, conventional and complacent. In particular the checking out of adjective 'Conventional' is typical of individuals with low creativity.

The adolescents with low entrepreneurial creativity do not possess well crystallized perceived self-images. However, since the process of development (mental, social, emotional etc.) is continuous and regular. It is possible that during the period of adolescence, which is characterized by uncertainty, reservedness, rebellion, and mental strife, an individual is likely to have a cautious approach to assessing his personality. However, each new perception and each new experience, it can be presumed, will have the ability to change the previously formed concepts and, in the process, get changed and modify itself.

6.15. SELF-IMAGES OF ADOLESCENTS WITH HIGH AND LOW ENTREPRENEURIAL CREATIVITY : CONCLUSIONS -

The following conclusions
can be drawn from the above
discussion :

- 1) Significant differences exist between the perceived Self-images of the adolescents with high and low entrepreneurial creativity. By and large the two groups of adolescents have been found to perceive themselves differently in terms of the adjectives contained in the Personality Word List (PWL). The present results therefore lend a convincing support to the hypothesis of the investigators, that difference in creativity levels may be due to basic differences in personality structures.
- 2) The adolescents with high entrepreneurial creativity can be said to be more energetic, dynamic, bold, practical, forward looking and self-controlled in comparison to their counterparts with low creativity. The self images of the highly creative adolescents can be considered as significantly dynamic as compared to these of adolescents with low creativity.

Thus, the profiles of the adolescents with high entrepreneurial creativity emerging from their responses to the PWL reveal that the 'highly creative adolescent entrepreneur' is an 'adventurous' person, 'risk taker', 'high achiever', 'dynamic' confident' and having an 'autonomous' personality. Since the adjectives 'clear thinking', 'practical' and 'active' appear rather high up on the continuum, it can be inferred that the adolescents with high entrepreneurial creativity are likely to emerge as 'decision making', forward looking persons, possessing a 'futuristic' disposition.

At the same time the highly creative adolescent entrepreneurs also possess a warm and sensitive facet to their multi-variate personalities.

The above mentioned results are in consonance with the studies conducted on the motivational components of business and

agricultural entrepreneurs (Singh, 1971), on the achievement motivation of the fast and slow progressing industrial entrepreneurs (Hindal 1969) and a cross-section of studies on the creative personality (Dallas and Gaire 1970; Roe Taylor, Knapp, Cattell, Macurdy, Mc Clelland, Eiduson, Chambers and Gough (reported by Barron), 1968 ; Mackinnon 1962; Dudek 1962, 1970, 1970a ; Khatena 1976, Khatena and Raina 1977 ; Raina 1968 ; Lalithamma 1973 ; Verma, 1973 ; Goyal 1974 ; Joshi 1974; Kumar 1978 , Singh 1980).

A significant result that can be crystallized on the basis of the profiles of adolescents with high entrepreneurial creativity is that their self-images tallies with the rationale underlining the different tests in the Battery of Test of Entrepreneurial Creativity (Ref. Chapter IV). This finding is an evidence towards ^{the}construct validity of the newly developed tests.

6.16. B. SELF-IMAGES OF ADOLESCENTS WITH HIGH AND LOW SCIENTIFIC CREATIVITY : RESULTS

The results obtained from the analysis of the responses of adolescents with high and low scientific

creativity to the PWL have been reported in Table 6.6 given below :

TABLE - 6.6

PERCEIVED SELF-IMAGES OF ADOLESCENTS IDENTIFIED AS HIGH AND LOW ON SCIENTIFIC CREATIVITY.

HIGH GROUP N = 120		LOW GROUP N = 120	
ADJECTIVES	*PERCENTAGE OF RESPONSES	ADJECTIVES	*PERCENTAGE OF RESPONSES
Active	59%	Complacent	55%
Averse	57%	Contented	55%
Cheerful	55%	Honest	51%
Confident	55%	Reticent	50%
Clear Thinking	50%	Unirritable	50%
Peaceful	48%	Progressive	44%
Capable	42%	Manly	43%
Self-Controlled	37%	Critical	38%
Conservative	34%	Efficient	32%
Positive	25%	Informal	25%

* Adjectives checked out by less than 25% adolescents in the population have not been included here.

6.17. DISCUSSION OF ^{THE} RESULTS

The results show that the adolescents with high scientific creativity have described themselves in terms of the adjectives viz ; 'Active' 'Brave', 'Cheerful', 'Confident', 'Clear Thinking', 'Graceful', 'Noble', 'Self-Controlled', 'Conservative' and 'Sensitive'.

More than half of the highly creative adolescents, have perceived themselves as being, 'Clear Thinking', 'Confident', 'Cheerful' and 'Brave' with the maximum preferences allotted to the adjective, 'Active' (59%).

With the possible exception of the adjectives viz, 'Conservative' and 'Sensitive', all the adjectives in terms of which the adolescents with high scientific creativity have perceived themselves are positive, and convey health, dynamism and vitality. The results show that the group of highly creative adolescents in the field of science, is characterised by greater self acceptance, high sense of well-being and a good degree of self-confidence.

The choice of the adjective namely, 'Conservative' reveals a tendency on the part of the highly creative adolescents to be away from the razzle dazzle of modernity and shun lime light which they are likely to get by their novel ways of thinking and doing things.

'Sensitivity' to environment and to social disapproval and neglect at the hands of the non-creative majority seem to be an important feature of the perceived self-images of the highly creative adolescents in the stream of science.

The adolescents with low scientific creativity have, on the other hand described themselves in terms of the adjectives 'Complacent', 'Contented', 'Honest', 'Reticent', 'Unirritable' 'Progressive', 'Manly', 'Critical', 'Efficient' and 'Informal'.

50% and more respondents in the lower group have perceived themselves as being 'Unirritable' 'Reticent' 'Honest', and 'Contented', with the maximum preference being given to the adjective 'Complacent' (55%).

The adjectives checked out by 50% and more by the adolescents with low scientific creativity are by and large described as being passive, conventional and revealing a lack of rigid internal standards. These may describe average individuals in every day life but not the creative and unconventional minority.

However the checking out of the adjectives viz; 'Progressive' (44%), 'Manly' (43%), 'Efficient' (32%) and 'Informal' (25%) indicate the existence of a desire to be included in the main stream of life, to be part of a 'dynamic' 'active' group. To some extent, these adjectives do characterise adolescents as a group.

The choice of the adjective viz; 'Critical' by the adolescents with low creativity seems to be some sort of a defence mechanism, and may reflect desire to rebel against the conventional norms which is a general characteristic of adolescents.

6.18. CONCLUSIONS

On the basis of the above results, the following conclusions can be drawn :

1) The adolescents with high scientific creativity have been found to describe themselves in terms of the adjectives viz; 'Active', 'Brave', 'Cheerful', 'Confident', 'Clear Thinking', 'Graceful', 'Noble', 'Self-Controlled', 'Conservative' and 'Sensitive'.

2) The adolescents with low scientific creativity have been found to perceive themselves in terms of the adjectives viz ; 'Complacent', 'Contented', 'Honest', 'Reticent',

'Unirritable', 'Progressive', 'Manly', 'Critical', 'Efficient', and 'Informal'.

3) The adolescents with high scientific creativity on the whole, have been found to describe themselves in terms of adjectives indicating optimism, energy, and a positive self-image together with a level of aspiration seemingly well within their productive resources. This result is in line with studies by (Bhan 1973; Gakhar 1975; Nair, 1976; Gupta 1977 and Singh; Mallapa and Upadhayaya 1977; Jha 1975).

4) Adolescents with low scientific creativity have on the whole, emerged as a 'non-anxious', 'socially conforming' and 'contented' group.

On the basis of the present results, it can be concluded that the adolescent endowed with high scientific creativity by and large is likely to be a dynamic, graceful, courageous, happy, self controlled and a confident person, albeit with shades of conservatism and sensitivity in his multivariate personality. He is likely to exhibit qualities like activity, confidence, clarity of thought, and self-control which are hall marks of scientific temper.

The results reported above are more or less in line with the studies of the creative personality of science students reported by (Goyal 1974), on personality variables of creative science students (Gopal 1975) and on certain correlates of interests in scientific pursuits (Bharadwaj and Gupta 1981), on thinking of pupils with high scientific ability (Mc Alpine 1972, Misra 1987).

6.19. C. SELF-IMAGES OF ADOLESCENTS WITH HIGH AND LOW MATHEMATICAL CREATIVITY : RESULTS

The results obtained from the analysis of the responses of adolescents with high and low

mathematical creativity to the PWL have been reported in Table 6.7 given below :

TABLE - 6.7

PERCEIVED SELF-IMAGES OF ADOLESCENTS IDENTIFIED AS HIGH AND LOW ON MATHEMATICAL CREATIVITY

HIGH GROUP N = 120		LOW GROUP N = 120	
ADJECTIVES	*PERCENTAGE OF RESPONSES	ADJECTIVES	*PERCENTAGE OF RESPONSES
Responsible	65%	Aggressive	58%
Noble	60%	Affectionate	58%
Punctual	60%	Excitable	55%
Brave	58%	Intelligent	50%
Clear-Thinking	57%	Honest	49%
Graceful	55%	Humorous	42%
Self-Controlled	50%	Reticent	34%
Strong	45%	Sophisticated	30%
Sensitive	38%	Mischievous	30%
Practical	31%	Contented	30%
Serious	26%	Competent	25%
Conservative	25%	Tresting	25%

* Adjectives checked out by less than 25% adolescents in the population have not been included here.

6.20. DISCUSSION OF RESULTS

The above Table reveals the percentage of checking out of different adjectives in the Personality Word List by 25% and more adolescents with high and low mathematical creativity. The results make it possible to undertake a comparative analysis between the responses of the two groups of adolescents in order to know, which adjectives have been checked out more frequently by them.

The results show that, the adolescents with high mathematical creativity describe themselves in terms of the adjectives namely, 'Responsible', 'Noble', 'Punctual', 'Brave', 'Clear Thinking', 'Graceful', 'Self-Controlled', 'Strong', 'Sensitive', 'Practical', 'Serious' and 'Conservative'.

50% and more respondents in the population of highly creative adolescents have been found to perceive themselves as 'Self-Controlled', 'Graceful', 'Clear Thinking', 'Brave', 'Punctual' and 'Noble' with maximum adolescents checking out the adjective viz; 'Responsible' (65%).

On the contrary, adolescents with low mathematical creativity, describe themselves in terms of the adjectives namely ; 'Aggressive', 'Affectionate', 'Excitable', 'Intelligent', 'Honest', 'Humorous', 'Reticent', 'Sophisticated', 'Mischievous', 'Contented', 'Competent' and 'Trusting'.

More than 50% adolescents in the low creativity group have checked out the adjectives viz; 'Intelligent', 'Excitable', 'Affectionate' with the maximum percentage of adolescents perceiving themselves as 'Aggressive' (58%).

On the basis of the present results, it can be said that the highly creative adolescents perceive themselves in 'Positive', 'Optimistic' terms. The checking out of adjectives viz; 'Noble', 'Punctual', 'Strong', 'Brave', 'Clear Thinking', 'Self-Controlled' and 'Responsible' the presence of high ego strength, high self-acceptance and a sense of personal worth. This result is in agreement with studies on the creative personality (Gakhar 1975; Nair 1976).

However, the adolescents with high mathematical creativity also consider themselves as being, 'Serious', 'Conservative' and 'Sensitive'. The probable reasons for the same could be as follows :

a) The creative minority till today, has largely been neglected and their potential stifled for want of opportunity. So it is possible that they have evolved into a 'sensitive' group.

b) Though creative ability is associated with radical thinking ^{and} deviating from the conventional mode of functioning, the highly creative wish to be perceived ^{as} traditional in their outlook. They may also possess a strong desire to be away from the modern ~~cultural~~ and social ^{influences}. This may explain their choice of the adjective, 'Conservative'. This finding corroborates the results reported by (Aaron and Malatesha 1972 and Bhan 1972).

c) A possible reason for the checking out of the adjective namely, 'Serious' could be the relative isolation and withdrawal of the creative individuals from their peers. Thus, they tend to project themselves in terms of adjectives like 'Sober' and 'Reserved'.

The preferences for the adjective 'Punctual' seems to be in consonance with the precision and logic and seriousness for which the discipline of mathematics is famous. Far from being sloppy and lethargic, mathematically talented adolescents are punctual, responsible and serious.

In sharp contrast to their highly creative counterparts, the adolescents with low mathematical creativity have described themselves in terms of the adjectives namely, 'Aggressive', 'Excitable', 'Mischievous', 'Competent', 'Sophisticated' and 'Intelligent' which have active, energetic and dynamic overtones characteristic of adolescent behaviour.

At the same time, the adolescents with low mathematical creativity have also rated themselves as being 'Contented', 'Trusting', 'Honest', 'Reticent', and 'Affectionate' which are relatively inactive, passive and conventional images.

Significantly, the adolescents in the group with low mathematical creativity perceive themselves as 'Intelligent' while adolescents with high creativity do not perceive themselves as such.

Comparing the self-images of the two groups we find that none of the adjectives checked out by more than 25% adolescents with high and low creativity are common to the two groups. Thus the self-images of the two groups are well differentiated and significantly different from each other.

6.21. SELF-IMAGES OF ADOLESCENTS WITH HIGH AND LOW MATHEMATICAL CREATIVITY : CONCLUSIONS

On the basis of the above discussion, the following conclusions can be drawn :

- 1) Highly significant differences exist between the perceived self-images of the adolescents with high and low mathematical creativity. Both groups have expressed themselves in terms of radically contrasting adjectives.
- 2) The adolescents with high creativity in mathematics perceive themselves in terms of adjectives viz; 'Responsible', 'Noble', 'Punctual', 'Brave', 'Clear Thinking', 'Graceful', 'Self-Controlled', 'Strong', 'Sensitive', 'Practical', 'Serious', 'Conservative'.
- 3) The adolescents with low mathematical creativity perceive themselves in terms of the adjectives viz; 'Aggressive', 'Affectionate', 'Excitable', 'Intelligent', 'Honest', 'Humorous', 'Reticent', 'Sophisticated', 'Mischievous', 'Contented', 'Competent', 'Trusting'.

Thus on the basis of the present results, the adolescents endowed with high mathematical creativity is likely to emerge as a bold, dynamic, optimistic individual possessing a sense of self worth and having a more or less healthy attitude towards life. At the same time he is of a shy, affectionate and simple disposition possessing self-control is sober, serious and responsible.

The above results more or less are in line with the findings of (Jha 1975; Kumar 1978; Kaur 1978; Lalithamma 1973; Aaron and Malatesha 1972; Gupta 1977; Singh 1978; Nair 1976).

6.22.D. SELF-IMAGES OF ADOLESCENTS WITH HIGH AND LOW GENERAL CREATIVITY

The results obtained from the analysis of the responses of adolescents

with high and low general creativity on the Personality Word List (PWL) have been reported in Table 6.8.

TABLE - 6.8

PERCEIVED SELF-IMAGES OF ADOLESCENTS IDENTIFIED AS HIGH
AND LOW ON GENERAL CREATIVITY

HIGH GROUP N = 120		LOW GROUP N = 120	
ADJECTIVES	*PERCENTAGE OF RESPONSES	ADJECTIVES	*PERCENTAGE OF RESPONSES
Active	62%	Contented	59%
Confident	59%	Easy Going	54%
Disciplined	55%	Intelligent	50%
Clear Thinking	55%	Reticent	50%
Cheerful	50%	Uncritical	50%
Fair-Minded	48%	Defiant	47%
Happy	40%	Excitable	41%
Responsible	38%	Unirritable	34%
Conservative	25%	Pessimistic	28%
Sensitive	25%	Pretending	25%

*Adjectives checked out by less than
25% adolescents have not been
included here.

6.23. DISCUSSION OF RESULTS

Table 6.8. shows the percentage
of checking out of different
adjectives in the PWL by 25%

and more adolescents with high and low general creativity.
Thus, it is possible to compare and contrast their choice of
adjectives with a view to delineating their self-images.

From the results, it can be seen that the adolescents
with high general creativity have described themselves in terms
of the adjectives namely ; 'Active', 'Confident', 'Displined',
'Clear Thinking', 'Cheerful', 'Fair Minded', 'Happy', 'Responsible',
'Conservative' and 'Sensitive'.

More than 50% adolescents have perceived themselves as
having 'Clear Thinking', on the one hand and 'Disciplined' and
'Confident' on the other with the maximum number of adolescents
checking out the adjective 'Active' (62%).

The results show that the self-images of the adolescents
with high general creativity in terms of the adjectives contained
in the PWL, are positive and indicative of high self-acceptance,
freedom from anti-social tendencies and a strong self-sentiment.

However, the highly creative group prefer to maintain an attitude of non-conformity where the so called modern culture and values are concerned. This is indicated by the choice of the adjective 'Conservative' (25%). The checking out of the adjective 'Sensitive' (25%), indicates either a heightened awareness of the environment, or a refined nature.

As compared to their highly creative counterparts, the adolescents with low general creativity, have been found to describe themselves in terms of entirely different adjectives. Thus, the group with low general creativity have described themselves in terms of adjectives namely 'Contented', 'Easy Going', 'Intelligent', 'Reticent', 'Uncritical', 'Defiant', 'Excitable', 'Unirritable', 'Pessimistic' and 'Pretending'.

50% and more respondents in the sample of adolescents with low general creativity have perceived themselves, as being, 'Uncritical', 'Reticent', 'Intelligent' 'Easy Going', with the maximum percentage checking out the adjective 'Contented' (59%).

Barring the choice of the adjectives namely, 'Excitable' and 'Defiant' which indicate dynamism, all the other adjectives checked out by the adolescents in the low group show the subjects as possessing passive and ordinary self-images. The results corroborate the findings of (Joshi 1974) and several other researches on the personality characteristics of individuals with low creativity, cited in the earlier sections dealing with the self-images of adolescents with low entrepreneurial, mathematical and scientific creativity.

With particular reference to the checking out of the adjective 'Intelligent' by almost half of the respondents by the low group it can be observed that, a desire to be viewed as 'Intelligent' rather than 'Creative' exists in the adolescents with low general creativity. This result theoretically reaffirms the findings of researchers regarding the demarcation

between the domains of creativity and 'intelligence'.

In the present study, while the adolescents with low creativity have perceived themselves as 'intelligent' their counterparts with high creativity have no similar self-image. Thus, ^{the}adolescents with low creativity would be intelligent successful and satisfied but they certainly lack the dynamism and self-control which are the characteristics of the highly creative group.

6.24. SELF-IMAGES OF ADOLESCENTS WITH HIGH AND LOW GENERAL CREATIVITY : CONCLUSIONS

On the basis of the above discussion, the following conclusions can be crystallized :

- 1) The adolescents with high general creativity have been found to describe themselves in terms of the adjectives namely; 'Active', 'Confident', 'Disciplined', 'Clear Thinking', 'Cheerful', 'Fair Minded', 'Happy', 'Responsible', 'Conservative', and 'Sensitive'.
- 2) The adolescents with low general creativity level have been found to perceive themselves in terms of the adjectives namely; 'Contented', 'Easy Going', 'Intelligent', 'Reticent', 'Uncritical', 'Defiant', 'Excitable', 'Unirritable', 'Pessimistic' and 'Pretending'.
- 3) No overlapping exists between the groups of adolescents with high and low general creativity. In respect of their perceived self-images and the adolescents with high and low general creativity have been found to perceive themselves differently in terms of the adjectives contained in the PWL. Thus the groups of adolescents do have significantly different self-images and personality structures.

6.25 . PROFILES ON VOCATIONAL PREFERENCES : INTRODUCTION

Behind the choice of a particular profession lies a long, and continuous process of vocational development. Many vocations are likely to be considered, perceived from various angles and, consequently, rejected or accepted by an individual as his prospective choices at various stages of his development. Among a host of factors in the environment which trigger what Rosenberg (1957) terms "a series of progressive delimitations of alternatives," the part played by the status or prestige value of vocations in diminishing or heightening the images of vocations in the eyes of one contemplating them as possible choices, is recognized by research (Krishnan, 1956, Grunes, 1956, Rosenberg, 1957, Sharma 1958, Pandey, 1963, Hilton et al. 1970). This is so to a greater degree in a country like India where, in the absence of school guidance programs, the status value of vocations is perhaps the single most important factor influencing children and parents alike in choosing vocations for the former (Sinha and Dash, 1959, Cook, 1962, Singh and Prasad, Razler, 1963). What under such circumstances, are the vocational preferences of creative adolescents is naturally an interesting question for research.

In the present investigation, an attempt was therefore made to study and compare the vocational preferences of the adolescents with low and high Entrepreneurial Creativity, Scientific Creativity, Mathematical Creativity and General Creativity. For this purpose, the Vocational Preferences Checklist (VPC) by Gupta et. al. was administered. The procedure for responding to the VPC and analyzing the preferences have already been explained earlier.

6.26 . RESULTS

The vocational preferences of the adolescents with high and low Entrepreneurial, Mathematical, Scientific and General Creativity have been reported in Tables 6.9, 6.10, 6.11 and 6.10 respectively.

(COMMERCE GROUP) The Table 6.9 shows the percentages of checking out of different vocations in the VFC, by 25% and more, of the groups of adolescents with high and low Entrepreneurial Creativity. From the table, it is possible to compare and analyse the vocations which have been checked out in order of magnitude by the two groups.

TABLE - 6.9
VOCATIONAL PREFERENCES OF ADOLESCENTS IDENTIFIED AS HIGH AND LOW ON ENTREPRENEURIAL CREATIVITY

HIGH GROUP N = 120		LOW GROUP N = 120	
VOCATION	*PERCENTAGE OF RESPONSES	VOCATION	*PERCENTAGE OF RESPONSES
Bank Cashier	50%	Bank Officer	46%
Bank Officer	50%	Bank Cashier	46%
Chartered Accountant	50%	Chartered Accountant	46%
Lecturer	46%	Teacher / Lecturer	42%
Judge	42%	Clerk	33%
Economist	42%	Engineer	33%
Army Officer	37%	Lawyer	32%
Engineer	37%	Author / Writer	30%
Poet	25%	Singer	25%
Musician	25%	Aeroplane Pilot	25%

*Vocations checked out by less than 25% adolescents in the population, have not been included

6.27. DISCUSSION OF RESULTS It can be observed from the Table given above that, adolescents with high and low Entrepreneurial Creativity are conscious of the scope and demands of their chosen stream viz; commerce. This is indicated by their checking out of the vocations viz ; 'Bank Officer', 'Bank Cashier' and 'Chartered Accountant'. This reveals that there is considerable overlapping between the choices of the adolescents with high and low entrepreneurial creativity with regard to their top three vocational priorities / preferences.

46% of the highly creative adolescents have shown preference for the profession of a lecturer. This choice they have in common with their counterparts with low creativity. This result could be of considerable interest because the teaching profession generally does not enjoy^a very high status in our society and is considered a last resort by many. Thus, the place of the vocation of a lecturer which is rather high on the continuum proves that teaching is likely to occupy a fairly prominent place among the adolescents with high and low entrepreneurial creativity.

†

The results show that the adolescents with high and low creativity in the field of 'Commerce' have surprisingly expressed their preference for a science based vocation like engineering. Since several enterprises being set up these days are being successfully run by professionals like engineers, no wonder our creative adolescents also visualize for themselves such a vocation.

Likewise, both the groups, one exhibiting high and the other low entrepreneurial creativity have chosen, albeit low down on the continuum the vocations namely ; Musician and Singer.

In fact, barring the vocational preferences (Bank Cashier(50% and 46%); Bank Officer (50% and 46%); Chartered Accountant (50% and 46%); Lecturer/Teacher (46% and 42%); and Economist (42%), all the other vocational preferences of the highly creative adolescents are more or less unrelated to their own stream of study. E.g. 'Army Officer', 'Engineer', 'Judge', 'Poet' and 'Musician'. However, this tendency is visible to a greater extent among adolescents with low entrepreneurial creativity which shows that vocational preferences of the highly creative group are more consistent with the stream of subjects selected.

The adolescents with low entrepreneurial creativity have also shown preference for the vocations viz; 'Engineer', 'Lawyer', 'Author', 'Singer' and 'Aeroplane Pilot'. The possible reasons for these seemingly illogical and unrelated trends among the vocational preferences of adolescents with both high and low entrepreneurial creativity, could be as follows :

a) Even though an individual may not be equipped for a particular profession, economic and social prestige or status associated with a profession, may influence him to choose it at least at the school stage (Pandey, 1963). The status value seems to influence adolescents with low entrepreneurial creativity more than their highly creative counterparts.

b) A majority of these vocational preferences (Lawyer^w, Aeroplane Pilot, Judge, Army Officer) involve action or adventure, a weakness for which is a characteristic of the age group in consideration. (It has been pointed out that the vocational choices offer an adolescent a socially approved way to achieve indirect or substitute gratifications for motives such as social recognition, aggression, dominance, nurturance, and sexual curiosity - which may have become strong but not fully gratified during their preceding years - Mussen, Conger, and Kagan, 1963).

An unusual and interesting feature of the results which can be observed from the responses of the adolescents with both high and low entrepreneurial creativity is the checking out of the vocations viz ; 'Poet' and 'Musician' by the highly creative and the vocation viz; 'Singer' by the adolescents with low creativity. This indicates that the adolescents with high and low entrepreneurial creativity also possess a sensitive, artistic, and aesthetic dimension to their personality and these choices may be independent of ^{the} creative level ^{and be} more as a channel of emotional expression rather than creative process.

6.28. VOCATIONAL PREFERENCES OF ADOLESCENTS WITH HIGH AND LOW ENTREPRENEURIAL CREATIVITY; CONCLUSIONS

From the above discussion
the following conclusions
can be crystallized :

a) Much overlapping exists in the vocational preferences of the adolescents with high and low entrepreneurial creativity, although both the groups retain their individuality in the choice of a few vocations.

b) The wide variety in the vocational choices of the adolescents with high and low creativity in commerce (Chartered Accountant to Bank Cashier/Officer/Clerk to Musician and Poet) can be taken as an indication of familiarity with the 'world of work' on the part of the adolescents. While the adolescents with high and low entrepreneurial creativity give evidence of realistic vocational choices consistent with their subjects of study, adolescents with high creativity have been found to be somewhat maturer and more consistent in their vocational preferences.

c) Both the groups of adolescents, one exhibiting high and the other low entrepreneurial creativity, have been found to show qualities of dynamism, adventure and enthusiasm, as is indicated by their choices of vocations which are totally unrelated to their chosen stream. This result could prove interesting from the point of view of research in general as it contradicts the findings of many studies (Paramesh and Narayan 1974, Bhan 1973, Singh and Mehra 1981 etc.), which have reported that the vocational aspirations and interests of highly creative people are vastly different from their counterparts with low creativity.

6.29. RESULTS (MATHEMATICS GROUP)

The Table 6.10 shows the percentages of checking out of different vocations in the VPC, by 25% and more, of the groups of adolescents with high and low Mathematical Creativity. From the Table, it is possible to compare and analyse the vocations which have been checked out in order of magnitude by the two groups.

TABLE - 6.10

VOCATIONAL PREFERENCES OF ADOLESCENTS IDENTIFIED AS HIGH
AND LOW ON MATHEMATICAL CREATIVITY.

HIGH GROUP N = 120		LOW GROUP N = 120	
VOCATION	*PERCENTAGE OF RESPONSES	VOCATION	*PERCENTAGE OF RESPONSES
Industrial Engineer	62%	Accountant	58%
Air Force Officer	60%	Air Force Officer	55%
IAS Officer	58%	A. Pilot	55%
IFS Officer	55%	Engineer	50%
Scientist	50%	IAS	50%
Lawyer	48%	Scientist	48%
Accountant	44%	Doctor	38%
Lecturer	38%	Bank Officer	32%
Fighter Pilot	35%	Computer Programmer	29%
Bank Officer	25%	Horticulture Officer	25%

*Vocations checked out by less than
25% adolescents in the population have
not been included here.

6.30. DISCUSSION OF RESULTS The above Table shows the
ten vocations preferred in
order of magnitude by the adoles-
cents with high and low mathematical creativity. With the
most preferred/checked vocation at the top of the continuum.
From the Table, it is possible to compare and contrast the
vocational preferences of the adolescents with high and low
creativity.

The highly creative adolescents in the field of
mathematics have checked out a cross section of vocations which
are not normally associated with the stream of mathematics.
50% of the respondents have shown preference for vocations,
namely; 'Scientist', 'IFS', 'IAS', 'Air Force Officer' with the
maximum number opting for the vocation viz; 'Industrial
Engineer' (62%). The chief reason behind these choices made by
the highly creative adolescents seems to be the status value
and prestige associated with these vocations which has also
been corroborated by research (Krishnan, 1956; Grunes 1956;

Rosenberg 1957; Sharma 1958; Pandey 1963; Hilton et. al. 1970). It is quite likely that the adolescents with high mathematical creativity are not fully aware of the responsibilities involved in these vocations but have rated them quite high solely on the basis of the 'glitter' and glamour surrounding the vocations of IAS^{officer}/IFS^{officer}/Scientist etc. Further, it seems that adolescents do not have a clear idea as to which professions involve mathematical talents. On the other hand, it is also true that chances of scoring high in the competition tests are high for students opting mathematical subjects.

Nonetheless, the adolescents with high mathematical creativity have exhibited a daring streak in their personalities - fact is revealed by the checking out by 35% adolescents of the vocation viz; Fighter Pilot, requiring great responsibility, seriousness, self-control, and boldness,

However, adolescents with high creative in mathematics have also selected vocations like, Lecturer, Bank Officer and Accountant which indicate that, though these vocations are rated relatively low in their^{order of} preferences, these seem to interest the adolescents with high mathematical creativity. This may be due to popular belief that these professions involve high proficiency in arithmetic/mathematics.

The adolescents with low mathematical creativity, have checked out the vocations of 'Accountant', 'Air Force Officer', 'IAS Officer', 'Scientist', 'Pilot' and 'Bank Officer' which are in common with their highly creative counterparts. However, the choices of the adolescents with low creativity give maximum preference for the vocation of an 'Accountant'.

50% adolescents with low creativity have checked out the vocation of 'Engineer' showing thereby that in the eyes of the adolescents the engineering profession still commands high status.

The professions/vocations of 'Doctor' and 'Scientist' have appeared rather low on the continuum showing that these professions do not rate very high among the adolescents in general and among adolescents with low mathematical creativity. The choice of the vocation of a 'Computer Programmer' by 29% adolescents in the low creativity group suggests that they are conscious of current and future trends in technological innovation. The fact that adolescents with low mathematical creativity are willing to take up a remote, relatively unknown vocation like, Horticulture Officer could be indicative of unrealistic choice on their part.

**6.31. VOCATIONAL PREFERENCES OF
ADOLESCENTS WITH HIGH AND LOW
MATHEMATICAL CREATIVITY;
CONCLUSIONS**

On the basis of the above discussion, the following conclusions can be drawn :

- a) The adolescents with high mathematical creativity have shown preference for the vocations namely; 'Industrial Engineer', 'Air Force Officer', 'IAS' ^{Officer} ~~Officer~~ 'IFS' ^{Officer} ~~Officer~~ 'Scientist', 'Lawyer', 'Accountant', 'Lecturer', 'Fighter' 'Pilot' and 'Bank Officer'.
- b) The adolescents with low mathematical creativity have shown preferences for the vocations namely, 'Accountant', 'Air Force Officer', 'Aeroplane Pilot', 'Engineer', 'IAS Officer', 'Scientist', 'Doctor', 'Bank Officer', 'Computer Programmer' and 'Horticulture Officer'.
- c) The vocations which have been checked out jointly by both the highly creative and low creative group of adolescents are those of 'Air Force Officer', 'Scientist' 'IAS Officer', 'Bank Officer', 'Engineer and 'Pilot'.
- d) The vocational preferences of the two groups of adolescents indicate that. they are familiar with a multitude of occupations, especially the modern ones. However, they seem to be by and large unfamiliar with the responsibilities and implications of the vocations chosen by them. Their vocational

choices are not consistent with the stream of subjects and seem to be somewhat unrealistic and influenced by the status of the professions.

e) There appears to be lack of awareness about the avenues/areas/vocations open for a creative mathematician; nevertheless, the adolescents with high mathematical creativity have chosen occupations ('Fighter Pilot', 'Industrial Engineer', 'IFS', 'Accountant', 'Lawyer', 'Scientist') which require logic and precise thinking generally considered to be associated with the discipline of mathematics.

6.32. RESULTS (SCIENCE GROUP) The Table 6.11 shows the percentages of checking out of different vocations in the VPC, by 25% and more, of the groups of adolescents with high and low Scientific Creativity. From the Table, it is possible to compare and analyse the vocations which have been checked out in order of magnitude by the two groups.

TABLE - 6.11
VOCATIONAL PREFERENCES OF ADOLESCENTS IDENTIFIED AS HIGH AND LOW ON SCIENTIFIC CREATIVITY

HIGH GROUP VOCATION	N = 120 *PERCENTAGE OF RESPONSES	LOW GROUP VOCATION	N = 120 *PERCENTAGE OF RESPONSES
Scientist	60%	Botanist	59%
Doctor	58%	Scientist	58%
Engineer	56%	Fighter Pilot	55%
IPS	54%	Engineer	55%
Fighter Pilot	51%	Doctor	49%
Army Officer	49%	Air Host/Hostess	47%
Judge	47%	IPS	38%
Lecturer	42%	Judge	32%
IFS	38%	Lecturer	29%
Air Force Officer	26%	Army Officer	27%
Lawyer	25%	Singer	25%

*Vocations checked out by less than 25% adolescents in the population have not been included

6.33. DISCUSSION OF ^{THE} RESULTS

Table 6.11 shows the ten vocations preferred most by the adolescents with high and low Scientific Creativity, with the most preferred vocation given at the top of the Table. From the results, it is possible to compare and contrast the vocational preferences of the adolescents with high and low Scientific Creativity.

The adolescents endowed with high Scientific Creativity have chosen the vocations viz ; 'Scientist', 'Doctor', 'Engineer', 'IPS Officer', 'Fighter Pilot', 'Army Officer', 'Judge', 'Lecturer', 'IFS Officer', 'Air Force Officer' and 'Lawyer' respectively.

More than 50% creative adolescents in the science group have shown preference for the vocations namely ; 'Fighter Pilot', 'IFS Officer', 'Engineer' and 'Doctor' with the maximum preference shown for the vocation of a 'Scientist' (60%).

The choice of the vocation viz ; 'Engineer', 'Scientist', and 'Doctor' by majority of highly creative adolescents, indicates 'consistency in their vocational aspiration' and 'realistic' career preferences on their part. Whether or not they are certain which particular aspect of science they wish to enter cannot really be predicted. This suggests that further differentiation among vocations is not present.

That the adolescents with high scientific creativity are willing to try out other vocations, seemingly unrelated to their own field of study, is evident by their checking out of the vocations viz ; 'IPS Officer', 'Fighter Pilot', 'Army Officer', 'Judge', 'IFS Officer', 'Air Force Officer' and 'Lawyer'. However, here they seem to be mainly influenced by the social value associated with these vocations and it is likely that the pros and cons involved in these choices are not fully crystallized in their minds. At the same time, each of the services represented by these vocations does require

of the utilization of scientific abilities and level of sophistication to merit attention.

The checking out of the vocation of a 'Lecturer' as the eighth choice by the adolescents with high Scientific Creativity indicates that the teaching profession even though not rated as a 'top level' vocational choice with them, still attracts prospective entrants with high scientific creativity.

The adolescents with low scientific creativity have shown preferences for the vocations namely ; 'Botanist', 'Scientist', 'Fighter Pilot', 'Engineer', 'Doctor', 'Air Host/Hostess', 'IPS Officer', 'Judge', 'Lecturer', 'Army Officer' and 'Singer'. Thus there is a good deal of overlapping in the preferences of adolescents with high and low scientific creativity.

More than 50% adolescents have checked out the vocations viz ; 'Engineer', 'Fighter Pilot' and 'Scientist', with maximum percentage of adolescents choosing the vocation of 'Botanist' (59%).

The top two vocational choices of the adolescents with low creativity (low group) are realistic and consistent with their stream and subjects of study. These preferences also reveal a desire on the part of the low group, to aspire for something 'higher' than the 'ordinary'. However, whether these choices prove to be within the bounds of their potential, is the question they are likely to face. The other vocational preferences of the adolescents with low scientific creativity ('IPS Officer', 'Judge', 'Doctor', 'Engineer'), also reveal a similar trend.

However the choice of the vocations viz ; 'Air Host / Hostess', 'Singer' and 'Army Officer', though not directly related to the stream of science, seem realisable as far as the adolescents with low scientific creativity are concerned. It is apparent nonetheless that the vocational preferences of the low group are not yet fully crystallized.

6.34. VOCATIONAL PREFERENCES OF ADOLESCENTS WITH HIGH AND LOW SCIENTIFIC CREATIVITY : CONCLUSIONS

On the basis of the
discussion, the
following conclusions
can be drawn :

- 1) The adolescents with high scientific creativity have shown preference for the vocations viz ; 'Scientist', 'Doctor', 'Engineer', 'IPS Officer', 'Fighter Pilot', 'Army Officer', 'Judge', 'Lecturer', 'IFS Officer', 'Air Force Officer' and 'Lawyer'.
- 2) The adolescents with low Scientific Creativity have checked out the vocations namely ; 'Botanist', 'Scientist', 'Fighter Pilot', 'Engineer', 'Doctor', 'Air Host/Hostess', 'IPS Officer', 'Judge', 'Lecturer', 'Army Officer' and 'Singer'.
- 3) The vocations for which the adolescents both with high and low scientific creativity have indicated preference are 'Scientist', 'Fighter Pilot', 'Doctor', 'Army Officer', 'Judge', 'Lecturer', 'IPS Officer' and 'Engineer'. The results show that considerable overlapping exists in the vocational choices preferences of the two groups of adolescents.
- 4) The vocational choices which are exclusive to the group of adolescents with high Scientific Creativity are 'IFS Officer', 'Air Force Officer' and 'Lawyer'.
- 5) The vocational choices exclusive to the group of adolescents with low Scientific Creativity are, 'Botanist', 'Air Host/Hostess' and 'Singer'.
- 6) It can be said that the highly creative people have a level of aspiration well within their productive resources (Bhan 1973). There is every possibility, of their being competent enough to maintain harmony, between their aspiration level and creative potential.

Whereas the adolescents with low scientific creativity may/may not be in a position to do full justice to their chosen vocations, they seem to possess a comparative level of aspiration even though the choices of the adolescents with low creativity are somewhat nonconsistent and scattered as compared to the choices of the adolescents with high creativity.

6.35. RESULTS (GENERAL GROUP)

The vocational preferences of the adolescents with high and low General Creativity have been reported in Table 6.12.

TABLE - 6.12

VOCATIONAL PREFERENCES OF ADOLESCENTS IDENTIFIED AS HIGH AND LOW ON GENERAL CREATIVITY

HIGH GROUP VOCATION	N = 120 *PERCENTAGE OF RESPONSES	LOW GROUP VOCATION	N = 120 *PERCENTAGE OF RESPONSES
Engineer	60%	Engineer	59%
Computer Programmer	53%	Beautician	56%
Fighter Pilot	55%	Pilot	54%
Doctor	51%	Computer Technician	51%
S	49%	Doctor	47%
Film Director	49%	Air Host/Hostess	42%
Lecturer	34%	Lecturer	40%
Lawyer	30%	Chemist	32%
Accountant	26%	Chartered Accountant	28%
Air Force Officer	25%	Army Officer	25%

* Adjectives checked out by less than 25% adolescents in the population have not be included.

6.36. DISCUSSION OF RESULTS

Table 6.12 shows the ten vocations preferred by the adolescents with high and low general creativity, with the most preferred vocations given in the descending order of preference. From the Table, it is possible to compare and contrast the vocational preferences of the adolescents with high and low general creativity.

The highly creative adolescents in the field of general creativity have shown preference for the vocations viz ; 'Engineer', 'Computer Programmer', 'Fighter Pilot', 'Doctor', 'IAS Officer', 'Film Director', 'Lecturer', 'Lawyer', 'Accountant' and 'Air Force Officer'.

More than 50% of the respondents in the 'high' ^{general creativi} group have chosen the vocations of 'Doctor', 'Fighter Pilot', 'Computer Programmer' with the maximum preference going to the vocation of an 'Engineer'.

Since the status value of different vocations could be a strong factor in vocational choice ; reason for the choice of vocations that of Doctor, Computer Programmer, Fighter Pilot, Engineer, IAS and Chartered Accountant is obvious. It can also be argued that creativity can find its scope and rewards in most fields of endeavour including the vocations mentioned above. It is therefore quite possible that the adolescents with high general creativity are aware of the abilities involved in these professions, and have checked out their preferences with full responsibility.

The choice of the vocation of an 'Engineer' reveals that maximum percentage of adolescents (60%) still rate it as a 'top level' ^{and} 'high profile' vocation. The same vocation has been chosen by maximum adolescents in the low group (59%). This may be due to the fact that the subjects are ^{mostly} non-medical subjects.

The choice of the vocation viz ; Film Director, which has significantly been preferred over the vocations of Film Actor/ 'Actress' is note worthy. The vocation of Film Director as compared to that of Actor/Actress requires novelty in thinking, organizational ability, constant mental shifts, originality and productive capability - all of these are associated with the process of creative thinking that have been hall marks of creative film directors like Satyajit Roy, Raj Kapoor, Mrinal Sen, Shyam Benegal etc.

The highly creative group have however, also checked out the vocations of Accountant, Air Force Officer, 'Lecturer, and Lawyer (preferred over the vocation of a Judge). These vocations also seem to interest the adolescents with high general creativity.

The adolescents with low general creativity, on the other hand, have shown preference for the vocations viz ; 'Engineer', 'Beautician', 'Pilot', 'Computer Technician', 'Doctor', 'Air Host/Hostess', 'Lecturer', 'Chemist', 'Chartered Accountant' and 'Army Officer'.

More than 50% adolescents with low general creativity have checked out the vocations namely, 'Computer Technician', 'Pilot' and 'Beautician', with top preference being given to the vocation of an Engineer (59%).

Despite the influx of a multitude of occupations in the 'world of work', the choice of the vocation, 'Engineer' still retains its old prestige among adolescents with both high and low creativity.

The choice of the vocations namely {Computer Technician', 'Beautician', 'Chemist' and 'Air Host/Hostess' indicates that the adolescents with low general creativity have a reasonably good knowledge of many job avenues. Further, it shows that the adolescents in the low group do not seem to be solely motivated/influenced by the socio-economic status of vocations, This reason could explain their choice of the vocation viz ; 'Chemist'. In fact their choices are somewhat more realistic than their counterparts. This is revealed in their realistic and down to earth selection of the vocations namely, 'Beautician', 'Computer Technician' and 'Air Hostess'. The level of adolescents with high creativity is somewhat higher than the low group which is indicated by their choice of the vocation of 'Computer Programmer' over and above the vocation of a 'Computer Technician'.

6.37. VOCATIONAL PREFERENCES OF ADOLESCENTS WITH HIGH AND LOW GENERAL CREATIVITY : CONCLUSIONS

The following conclusions
can be crystallized from
the above discussion :

- 1) The highly creative adolescents in the area of general creativity have shown preferences for the vocations viz ; 'Engineer', 'Computer Programmer', 'Fighter Pilot', 'Doctor', 'IAS Officer', 'Film Director', 'Lecturer', 'Lawyer', 'Accountant' and 'Air Force Officer'.
- 2) The adolescents with low general creativity have selected the vocations viz ; 'Engineer', 'Beautician', 'Pilot', 'Computer Technician', 'Doctor', 'Air Host/Hostess', 'Lecturer', 'Chemist', 'Chartered Accountant' and 'Army Officer'.
- 3) The vocations for which both the groups of adolescents have shown preference, are 'Engineer', 'Pilot', 'Doctor' and 'Lecturer'. The vocation of the Engineer happens to rank as the first choice among the two groups of adolescents.
- 4) The vocations chosen by the adolescents with high general creativity are somewhat higher in social status and prestige as compared to the choices of the adolescents with low creativity.
- 5) The vocations chosen by adolescents with high general creativity have a greater range and diversity as compared to the vocational choices of their counterparts with high scientific, mathematical and entrepreneurial creativity. This may be due to less streamlining with regards to subjects in their case. Even then, some bias towards knowledge requiring scientific/technical knowledge is due to the fact that a number of students in the group are science subjects.

**6.38. COMPARATIVE PROFILES OF
ADOLESCENTS WITH HIGH SCIENTIFIC,
MATHEMATICAL, ENTREPRENEURIAL CREATIVITY
WITH REGARDS TO SELECTED VARIABLES:
INTRODUCTION**

After delineating
and comparing the
profiles of adoles-
cents with high and
low Scientific,

Mathematical, Entrepreneurial and General Creativity namely;
Interpersonal Relations (CPIR + TPIR + SIR + FIR) and Intelli-
gence, Locus of Control, Things Done On Your Own Checklist,
Verbal Creativity, Non-Verbal Creativity, Overall Creativity,
Achievement, Study Habits (Habits With Regard To Time And Duration;
Mode of Study; Preparation for Examinations; Class Room Study;
Extra Reading; Planning the Study; Memorization and Overall Study
Habits), Self-Images (Perceived), and Vocational Preferences, a
need was felt to compare and analyse the profiles of adolescents
with high Scientific, Mathematical, Entrepreneurial and General
Creativity on the selected variables viz; Total Interpersonal
Relations, Intelligence, Things Done On Your Own Checklist, Locus
of Control, Achievement and Total Study Strategy, with a view to
comparing their inter group status on the above variables.

6.39. PROCEDURE In order to study the 'inter-group differences'
between the adolescents with high Scientific,
Mathematical, Entrepreneurial and General Creati-
vity on the selected variables (mentioned above), the Significance
of Differences between the Means of the four groups of adolescents
were worked out and the results were interpreted statistically.

**6.40. A TOTAL INTERPERSONAL
RELATIONS : RESULTS**

The results of the significance
of differences between the mean
scores of adolescents with high

Scientific, Mathematical, Entrepreneurial and General Creativity
on the Total Interpersonal Relations (TIPR) have been given in
Table 6.13. From this Table, it becomes possible to compare and
study the relative status of interpersonal relations of the
adolescents, who are highly creative in the streams of Science,
Mathematics, Commerce and General Fields.

TABLE - 6.13

INTER GROUP DIFFERENCES AMONG ADOLESCENTS WITH HIGH MATHEMATICAL, ENTERPRENEURAL, SCIENTIFIC AND GENERAL CREATIVITY WITH REGARDS TO INTERPERSONAL RELATIONS

GROUPS		M ₁	SD ₁	M ₂	SD ₂	CR
Adolescents with high Mathematical creativity N ₁ = 120	Adolescents with high Scientific Creativity N ₂ = 120	388.53	60.27	416.47	54.11	** 3.78
Adolescents with mathematical creativity N ₁ = 120	Adolescents with high Enterpreneu- ral Creativity N ₂ = 120	388.53	60.27	414.02	74.61	** 2.91
Adolescents with high Mathematical creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	388.53	60.27	410.43	66.46	** 2.67
Adolescents with high Scientific creativity N ₁ = 120	Adolescents with high Enterpreneu- ral Creativity N ₂ = 120	416.47	54.11	414.02	74.61	0.29
Adolescents with high Scientific creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	416.47	54.11	410.43	66.46	0.77
Adolescents with high Enterpreneural creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	414.02	74.61	410.43	66.46	0.41

6.41. DISCUSSION OF ^{THE} RESULTS

Out of the six Critical Ratios reported in Table 6.13, as many three values are significant beyond .01 level of confidence. The following results can be crystallized from the Table :

- 1) The difference between the mean scores of adolescents with high Mathematical Creativity and high Scientific Creativity on Total Interpersonal Relations is statistically significant, ($P < .01$). The results indicate that the adolescents with high Scientific Creativity have a significantly higher mean score on Total Interpersonal Relations as compared to their counterparts with high Mathematical Creativity.
- 2) A significant difference has been found to exist between the mean scores of the adolescents with high Mathematical Creativity and high Entrepreneurial Creativity on Interpersonal Relations, with the latter group having a significantly higher mean score than the former. Thus, the interpersonal relations of the adolescents with high Entrepreneurial Creativity are significantly superior as compared to that of adolescents with high Mathematical Creativity.
- 3) The value of the critical ratio computed between the mean scores of the adolescents with high Mathematical Creativity and high General Creativity on Total Interpersonal Relations is statistically significant. The results show that the interpersonal relations of the latter group are significantly superior than the former.
- 4) No significant difference has been found to exist between the mean scores of adolescents with high Scientific Creativity and high Entrepreneurial Creativity with regards to their Interpersonal Relations (TIR). The results show that these two groups of adolescents cannot be differentiated on the basis of their TIR scores.

5) The difference between the mean scores of adolescents with high Scientific Creativity and high General Creativity on Interpersonal Relations, is statistically insignificant. It can therefore be said that, the two groups of highly creative adolescents cannot be discriminated on the basis of TIR scores.

6) No significant difference has been found to exist between the mean scores of the adolescents with high Entrepreneurial Creativity and high General Creativity with regard to the Total Interpersonal Relations. This shows that the two groups of highly creative adolescents cannot be discriminated on the basis of their TIR.

6.42. CONCLUSIONS In the light of the above results, the following conclusions can be crystallized :

1) The adolescents with High Scientific Creativity have significantly superior, positive and healthy Interpersonal Relations with their parents, teachers, siblings and friends as compared to their counterparts with high Mathematical Creativity.

2) The Total Interpersonal Relations (TIR) of the adolescents with high Entrepreneurial Creativity are significantly better than those of the adolescents with high Mathematical Creativity.

3) With regard to their Total Interpersonal Relations, the adolescents with high General Creativity are significantly superior to the adolescents with high Mathematical Creativity.

It can thus be said that the adolescents with high Scientific Creativity, Entrepreneurial Creativity and General creativity have better Interpersonal Relations at home, School, and Society in comparison with their counterparts with high Mathematical Creativity.

The present study provides a convincing evidence that the overall interpersonal relations of the adolescents with high Scientific Creativity are the best followed by adolescents with high Entrepreneurial Creativity and adolescents with high General Creativity. Among the four groups of creative adolescents, the adolescents with high Mathematical Creativity have ^{the} poorest interpersonal relations. Thus the interpersonal relations as a variable has been found to differentiate between adolescents with high creativity in different fields.

6.43. ACHIEVEMENT;RESULTS The significance of difference between the mean scores on achievement of adolescents with high Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity have been given in Table 6.14 . From the Table it is possible to compare the relative achievement level of the adolescents who are highly creative in the streams of Science, Mathematics and Commerce and General Field.

TABLE - 6.14

INTER GROUP DIFFERENCES AMONG ADOLESCENTS WITH HIGH MATHEMATICAL, ENTREPRENEURIAL, SCIENTIFIC AND GENERAL CREATIVITY WITH REGARDS TO ACHIEVEMENT

GROUPS		M ₁	SD ₁	M ₂	SD ₂	CR
Adolescents with high Mathematical creativity N ₁ = 120	Adolescents with high Scientific Creativity N ₂ = 120	80.44	14.55	76.47	5.32	** 2.82
Adolescents with high Mathematical creativity N ₁ = 120	Adolescents with high Entrepreneurial Creativity N ₂ = 120	80.44	14.55	59.76	9.51	** 14.67
Adolescents with high Mathematical creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	80.44	14.55	64.03	11.45	** 9.76
Adolescents with high Scientific creativity N ₁ = 120	Adolescents with high Entrepreneurial Creativity N ₂ = 120	76.47	5.32	59.76	9.51	** 16.88
Adolescents with high Scientific creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	76.47	5.32	64.03	11.45	** 10.82
Adolescents with high Entrepreneurial creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	59.76	9.51	64.03	11.45	** 3.14

6.44 . DISCUSSION OF ^{THE} RESULTS

All the Critical Ratios reported in Table 6.14 are significant beyond .01 level of confidence.

The following results can be crystallized from the above Table:

- 1) A significant difference has been found to exist between the mean scores on achievement of adolescents with high **Mathematical** Creativity and high Scientific Creativity. The results show the achievement level of the adolescents with high Mathematical Creativity to be superior to that of the adolescents with high Scientific Creativity.
- 2) The difference between the mean scores on achievement, of adolescents with high Mathematical Creativity and high Entrepreneurial Creativity is statistically significant ($P < .01$). The results show that the former group achieves significantly higher than the latter.
- 3) The value of the critical ratio computed between the mean scores on achievement of the adolescents with high Mathematical Creativity and high General Creativity is statistically significant ($P < .01$). The results indicate that the former group achieves significantly higher academically, as compared to the latter group.
- 4) Adolescents with high Scientific Creativity and high Entrepreneurial Creativity differ significantly with regard to their Academic Achievement. The results show that the mean score of the former group is significantly higher than that of the latter. It can, therefore, be said that the adolescents with high Scientific Creativity achieve higher as compared to the adolescents with high Entrepreneurial Creativity.
- 5) The value of the critical ratio computed between the mean scores of adolescents with high Scientific Creativity and high General Creativity on Achievement is statistically significant ($P < .01$). The results show that the academic achievement of the former group is significantly superior to that of the latter.

6) The adolescents with high General Creativity have been found to achieve significantly higher than the adolescents with high Entrepreneurial Creativity ($P < .01$).

6.45 . INTER GROUP DIFFERENCES
BETWEEN ADOLESCENTS WITH HIGH
SCIENTIFIC, MATHEMATICAL, ENTRE-
PRENEURAL AND GENERAL CREATIVITY
ON ACHIEVEMENT : CONCLUSIONS

On the basis of the above discussion, the following conclusions can be drawn :

- 1) The adolescents with high Mathematical Creativity have been found to achieve significantly higher than the adolescents with high Scientific Creativity.
- 2) The adolescents with high Mathematical Creativity achieve significantly higher academically, as compared to the adolescents with high Entrepreneurial Creativity.
- 3) The achievement level of the adolescents with high Mathematical Creativity is distinctly superior to that of the adolescents with high General Creativity.
- 4) The adolescents with high Scientific Creativity have been found to achieve significantly higher than the adolescents with high Entrepreneurial Creativity.
- 5) The adolescents with high Scientific Creativity are better achievers academically, as compared to the adolescents with high General Creativity.
- 6) The adolescents with high General Creativity have been found to achieve significantly higher academically, in comparison with the adolescents with high Entrepreneurial Creativity.

It can thus, be inferred from the above conclusions that the adolescents with high Mathematical Creativity are the best achievers academically, followed by the adolescents with high Scientific Creativity and high General Creativity respectively. Among the four creative groups, the adolescents with high

Entrepreneurial Creativity have emerged as the poorest achievers.

Many researchers have reported a positive and significant relationship between creativity and scholastic achievement (Kaina 1968; Trivedi 1979; Khire 1971; Lalithamma 1973; Bagga 1973; Bedi 1974; Jain 1975; Pandit 1976; Mehdi 1977; Singh, Pathur and Saxena 1977; Singh 1976; Awasthy 1979; D' Lima 1979; Gupta 1979; Masih 1979; Sandhu 1979; Asha 1980; Vijaylakshmi 1980; and Jarial 1981). However, the present study provides an interesting^{and}/revealing picture of the differences between the achievement level of highly creative adolescents in four different fields.

6.46.C. INTELLIGENCE: The^{results of the}/significance of differences
 RESULTS between the mean scores of adolescents with high Scientific, Mathematical, Entrepreneurial and General Creativity on 'Intelligence' have been given in Table 6.15. From this Table, it becomes possible to compare and study the relative level of intelligence of the adolescents who are highly creative in the streams of Science, Mathematics, Commerce and the General field.

TABLE - 6.15

INTER GROUP DIFFERENCES AMONG ADOLESCENTS WITH HIGH MATHEMATICAL, ENTREPRENEURIAL, SCIENTIFIC AND GENERAL CREATIVITY WITH REGARDS TO INTELLIGENCE

GROUPS		M_1	SD_1	M_2	SD_2	CR
Adolescents with high Mathematical creativity $N_1 = 120$	Adolescents with high Scientific Creativity $N_2 = 120$	67.92	14.23	67.22	14.82	90.37
Adolescents with high Mathematical creativity $N_1 = 120$	Adolescents with high Entrepreneurial Creativity $N_2 = 120$	67.92	14.23	43.46	15.74	** 12.69
Adolescents with high Mathematical creativity $N_1 = 120$	Adolescents with high General Creativity $N_2 = 120$	67.92	14.23	50.73	14.79	** 9.19
Adolescents with high Scientific creativity $N_1 = 120$	Adolescents with high Entrepreneurial Creativity $N_2 = 120$	67.22	14.82	43.46	15.74	** 12.06
Adolescents with high Scientific creativity $N_1 = 120$	Adolescents with high General Creativity $N_2 = 120$	67.22	14.82	43.46	14.79	** 8.63
Adolescents with high Entrepreneurial creativity $N_1 = 120$	Adolescents with high General Creativity $N_2 = 120$	43.46	15.74	50.73	14.79	** 3.69

6.47. DISCUSSION OF ^{THE} RESULTS

Out of the sex critical ratios reported in Table 6.15, as many as five values are significant beyond .01 level of confidence. This implies that significant differences exist between the groups with regard to intelligence. The following results can be drawn from the Table :

- 1) No significant difference has been found to exist between the mean scores of adolescents with high Mathematical Creativity and high Scientific Creativity with regard to their level of Intelligence. This shows that the two groups of adolescents cannot be differentiated on the basis of their mean level of Intelligence.
- 2) The mean score of the adolescents with high Mathematical Creativity on Intelligence is significantly higher than that of the adolescents with high Entrepreneurial Creativity. The results show that the former group has a significantly superior level of Intelligence as compared to the latter.
- 3) The value of the critical ratio between the mean Intelligence scores of the adolescents with high Mathematical Creativity and high General Creativity is statistically significant ($P < .01$). The results show that the highly creative adolescents in the stream of Mathematics have a significantly superior level of Intelligence as compared to their counterparts with high General Creativity.
- 4) A significant difference has been found to exist between the adolescents with high Scientific Creativity and high Entrepreneurial Creativity on Intelligence, with the former group having a significantly higher mean score. Thus, it can be concluded that the adolescents with high Scientific Creativity have a superior level of Intelligence in comparison to the adolescents with high Entrepreneurial Creativity.
- 5) The difference between the mean scores of adolescents with high Scientific Creativity and high General Creativity on

on Intelligence is statistically significant ($P < .01$). The results indicate that the former group possesses a higher level of Intelligence as compared to the latter.

6) A significant difference has been found to exist between the mean scores of the adolescents with high Entrepreneurial Creativity and high General Creativity on Intelligence, with the former group having a lower level of Intelligence than the latter.

6.48. CONCLUSIONS On the basis of the above discussion, the following conclusions can be drawn :

1) The adolescents with high Mathematical Creativity and high Scientific Creativity cannot be differentiated on the basis of their mean Intelligence level.

2) The adolescents with high Mathematical Creativity have a higher level of Intelligence than the adolescents with high Entrepreneurial Creativity.

3) The level of Intelligence of the adolescents with high Mathematical Creativity is superior to that of the adolescents with high General Creativity.

4) The adolescents with high Scientific Creativity have a superior level of Intelligence as compared to the adolescents with high Entrepreneurial Creativity.

5) The adolescents with high Scientific Creativity have been found to possess a significantly higher level of Intelligence than the adolescents with high General Creativity.

6) The level of Intelligence of the adolescents with high General Creativity is higher than that of the adolescents with high Entrepreneurial Creativity.

The results convincingly show that the level of Intelligence of the adolescents with high Mathematical ^{Creativity} is the highest

among the four groups, followed by adolescents with high Scientific Creativity and adolescents with high General Creativity. Among the four groups of highly creative adolescents, the group with high Entrepreneurial Creativity has been found to possess the lowest level of Intelligence. Thus, Intelligence as a variable has been found to differentiate between adolescents with high creativity in different fields.

The results of the present investigation have provided further insight into the possible linkage of different types of creativity with intelligence levels. While the 'Threshold Hypothesis' of Getzel and Jackson explains how creativity and intelligence get differentiated at high IQ levels, the results of the present study go a step further in suggesting that high mathematical and high scientific creativity are linked with much higher level of intelligence as compared to creativity in entrepreneurial and general fields respectively. Infact, if high creativity in different spheres is to be ranked according to intelligence level, mathematical creativity can be placed at the top of the Table followed by scientific creativity, general creativity and entrepreneurial creativity.

6.49.D. THINGS DONE ON YOUR OWN
CHECKLIST : RESULTS

The results of the significance of differences between the mean scores of adolescents with high Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity on Self-Initiated Activities (Things Done On Your Own Checklist) have been given in Table 6.16.

TABLE - 6.16

INTER GROUP DIFFERENCES AMONG ADOLESCENTS WITH HIGH MATHEMATICAL, ENTERPRENEURAL, SCIENTIFIC AND GENERAL CREATIVITY WITH REGARDS TO SELF-INITIATED ACTIVITIES (THINGS DONE ON YOUR OWN CHECKLIST).

GROUPS		M_1	SD_1	M_2	SD_2	CR.
Adolescents with high Mathematical Creativity $N_1 = 120$	Adolescents with high Scientific Creativity $N_2 = 120$	19.30	9.42	17.44	7.10	1.74
Adolescents with high Mathematical Creativity $N_1 = 120$	Adolescents with high Entrepreneurial Creativity $N_2 = 120$	19.30	9.42	24.57	8.20	** 3.49
Adolescents with high Mathematical Creativity $N_1 = 120$	Adolescents with high General Creativity $N_2 = 120$	19.30	9.42	18.63	8.57	0.58
Adolescents with high Scientific Creativity $N_1 = 120$	Adolescents with high Entrepreneurial Creativity $N_2 = 120$	17.44	7.10	24.57	8.20	** 7.20
Adolescents with high Scientific Creativity $N_1 = 120$	Adolescents with high General Creativity $N_2 = 120$	17.44	7.10	18.63	8.57	1.18
Adolescents with high Entrepreneurial Creativity $N_1 = 120$	Adolescents with high General Creativity $N_2 = 120$	24.57	8.20	18.63	8.57	** 5.50

6.50. DISCUSSION OF ^{THE} RESULTS

Out of the six critical ratios reported in Table 6.16, three values are significant beyond .01 level of confidence. The following results can be crystallized from the Table :

- 1) The difference between the mean scores of adolescents with high Mathematical Creativity and high Scientific Creativity on Things Done On Your Own Checklist (SIA) is statistically insignificant. It can therefore be said that the adolescents with high mathematical creativity and scientific creativity cannot be differentiated on the basis of their Self-Initiated Activities. However, the value of the CR is large enough to be of symptomatic importance. Accordingly, it can be said that the adolescents with high Mathematical ^{Creativity} are likely to be somewhat more capable of initiating and completing, novel, interesting and unique activities on their own levels as compared to the adolescents with high Scientific Creativity.
- 2) A significant difference has been found to exist between the mean scores of adolescents with high Mathematical Creativity and high Entrepreneurial Creativity on Self-Initiated Activities. The results show that the latter group is more capable of initiating novel and interesting activities and completing them in comparison with the former.
- 3) No significant difference exists between the mean scores of adolescents with high Mathematical Creativity and high General Creativity on Things Done On Your Own Checklist (Self-Initiated Activities). The results show that the two groups of adolescents cannot be differentiated on the basis of their mean scores on this variable.
- 4) The value of the critical ratio computed between the mean scores of the adolescents with high Scientific Creativity and high Entrepreneurial Creativity on Self Initiated Activities is statistically significant ($P < .01$). The results show that the adolescents with high Entrepreneurial Creativity are more

capable of initiating and completing novel and interesting activities as compared to the adolescents with high Scientific Creativity.

5) The value of the critical ratio computed between the mean scores of adolescents with high Scientific Creativity and high General Creativity on Self-Initiated Activities is statistically insignificant. The results show that the two groups of adolescents cannot be differentiated on the basis of their activities initiated at their own levels.

6) A significant difference has been found to exist between the mean scores of adolescents with high Entrepreneurial Creativity and high General Creativity with the former group exhibiting a significantly higher mean score. The results indicate that the adolescents with high Entrepreneurial Creativity are significantly more capable of initiating novel activities and completing them as compared to their counterparts with high General Creativity.

6.51. CONCLUSIONS The following conclusions can be drawn from the above discussion :

1) The adolescents with high Entrepreneurial Creativity are more capable of initiating novel, interesting, unique and productive activities on their own and completing them, as compared to the adolescents with high Mathematical Creativity.

2) The adolescents with high Entrepreneurial Creativity have shown better capability as far as initiating and completing novel, interesting activities are concerned, in comparison to the adolescents with high Scientific Creativity.

3) The adolescents with high Entrepreneurial Creativity are more capable of initiating novel, and interesting activities and completing them as compared to the adolescents with high General Creativity.

4) The adolescents with high Mathematical Creativity are "likely to exhibit" better capacity to initiate and complete creative activities as compared to the adolescents with high Scientific Creativity.

5) The adolescents endowed with high Mathematical Creativity and General Creativity and on the one hand the adolescents with high Scientific creativity and General Creativity on the other, cannot be differentiated on the basis of their mean Scores on Things Done On Your Own Checklist.

On the basis of the above conclusions it can be said ~~that~~ the adolescents with high Entrepreneurial Creativity have been found to possess maximum capacity for initiating novel, interesting and creative activities and completing them on their own followed by the adolescents with high Mathematical Creativity and adolescents with high General Creativity respectively. The adolescents who have exhibited ^{the} least capacity for self initiated activities are the ones, highly creative in the field of science.

The results obtained in the present study do provide interesting differentiation between the adolescents endowed with high creativity in the fields of mathematics, science, commerce and general fields. Conventionally, it is held that the highly creative individuals initiate many activities on their own. While it is by and large true, the present results indicate that adolescents with high entrepreneurial creativity initiate maximum activities while adolescents with high scientific creativity initiate comparatively least activities among the four groups under comparison. One reason for this may be the lacklustre state of affairs of science teaching in our Higher Secondary Schools which does not inspire individuals to initiate activities on their own in leisure time. Secondly, science students are more occupied and always under pressure to prepare for examinations and competitive entrance tests, in engaging tutions etc. No wonder, they can hardly initiate many activities on their own, in the limited leisure hours at their disposal.

Thus the variable Self Initiated Activities (Things Done On Your Own Checklist) has been found to ^{adequately} differentiate between the adolescents with high creativity in different fields.

6.52. E. TOTAL STUDY STRATEGIES: The significance of differences on Study Strategies between the mean scores of adolescents with high Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity have been given in Table 6.17.

TABLE - 6.17
INTER GROUPS DIFFERENCES BETWEEN ADOLESCENTS WITH HIGH SCIENTIFIC, MATHEMATICAL, ENTREPRENEURIAL AND GENERAL CREATIVITY WITH REGARDS TO TOTAL STUDY STRATEGIES

GROUPS		M ₁	SD ₁	M ₂	SD ₂	CR.
Adolescents with high Mathematical Creativity N ₁ = 120	Adolescents with high Scientific Creativity N ₂ = 120	63.97	15.32	70.84	18.72	** 3.11
Adolescents with high Mathematical Creativity N ₁ = 120	Adolescents with high Entrepreneurial Creativity N ₂ = 120	63.97	15.32	87.24	23.94	** 8.98
Adolescents with high Mathematical Creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	63.97	15.32	85.62	31.50	** 6.76
Adolescents with high Scientific Creativity N ₁ = 120	Adolescents with high Entrepreneurial Creativity N ₂ = 120	70.84	18.72	87.24	23.94	** 5.92
Adolescents with high Scientific Creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	70.84	18.72	85.62	31.50	** 4.42
Adolescents with high Entrepreneurial Creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	87.24	23.94	85.62	31.50	0.45

6.53. DISCUSSION OF ^{THE} RESULTS

Out of the six critical ratios reported in the Table 6.17 as many as five values are significant beyond .01 level of confidence. The following results can be crystallized from the Table :

- 1) The difference between the mean scores of adolescents with high Mathematical Creativity and high Scientific Creativity on Study Strategies (TSS) is statistically significant ($P < .01$). The results show the overall Study Strategies of the adolescents with high Scientific Creativity to be superior to those of adolescents with high Mathematical Creativity.
- 2) A significant difference has been found to exist between the Study Strategies employed by the adolescents with high Mathematical Creativity and high Entrepreneurial Creativity. The results show that the latter group employs significantly superior Strategies for Study in comparison to the former.
- 3) The value of the critical ratio computed between the mean scores of the adolescents with high Mathematical Creativity and high General Creativity is statistically significant ($P < .01$). From the results it can be seen that the adolescents, creative in the General field have significantly superior Stud. Habits as compared with the adolescents with high Mathematical Creativity.
- 4) A significant difference has been found to exist between the adolescents with high Scientific Creativity and high Entrepreneurial Creativity, with regards to their Study Strategies (TSS). The results show that the adolescents with high Entrepreneurial Creativity employ superior Study Strategies as compared to the adolescents with high Scientific Creativity.
- 5) The value of the critical ratio computed between the mean scores of the adolescents with high Scientific Creativity and high General Creativity on TSS is statistically significant ($P < .01$). The results indicate that the latter group employs superior study strategies in comparison with the former.

6) The difference between the mean scores of adolescents with high Entrepreneurial and high General Creativity on Total Study Strategies is, statistically insignificant. The results indicate that, the two groups of adolescents cannot be discriminated on the basis of their TSS scores.

6.54. INTER GROUP DIFFERENCES AMONG ADOLESCENTS WITH HIGH MATHEMATICAL, SCIENTIFIC, ENTREPRENEURIAL AND GENERAL CREATIVITY WITH REGARDS TO TOTAL STUDY STRATEGY : CONCLUSIONS

On the basis of the above discussion, the following conclusions can be drawn :

- 1) The adolescents with high Scientific Creativity have been found to employ better and ^{more} positive strategies for studying as compared to the adolescents with high Mathematical Creativity. Thus it can be said that the Study Habits (Habits With Regard To Time and Duration ; Habits With Regard To Mode of Study ; Habits With Regard To Preparation For Examinations; Habits With Regard To Classroom Study ; Habits With Regard to Planning the Study ; Habits With Regard To Extra Reading and Habits With Regard To Memorization) of the adolescents with high Scientific Creativity are superior to those of the adolescents with high Mathematical Creativity.
- 2) The Study Habits (Named in Point 1) of the adolescents with high Entrepreneurial Creativity are better than those of the adolescents with high Mathematical Creativity.
- 3) The Study Strategies (Named in Point 1) employed by the adolescents with high General Creativity are superior to those employed by the adolescents with high Mathematical Creativity.
- 4) The Study Habits of the adolescents with high Entrepreneurial Creativity are better than those of the adolescents with high Scientific Creativity.
- 5) The Study Strategies employed by the adolescents with

high General Creativity are superior to those employed by the adolescents with high Scientific Creativity.

6) The adolescents with high Entrepreneurial Creativity and the adolescents with high General Creativity cannot be differentiated on the basis of their Study Strategies (SS).

The above results provide interesting insights into the Study Habits/Strategies of adolescents, endowed with high creativity in four important streams viz ; Science, Mathematics, Commerce and General fields.

The group of adolescents with high Entrepreneurial Creativity have been found to possess the best Study Habits, followed by adolescents with high General Creativity and high Scientific Creativity respectively. The group with the lowest mean score on Total Study Strategy is the one with high Mathematical Creativity. This suggests that high mathematical and Scientific Creativity are some what independent of study strategies. It is therefore quite possible that the adolescents with high Mathematical and Scientific Creativity, do not need a 'lengthy', 'laborious' and 'detailed' studying strategies and develop sustained habits for the same.

Another interesting reason for the low score of the adolescents with high Mathematical Creativity on Total Study Strategies could be that, these adolescents rely mostly on ('brain waves', 'flashes of insight', and 'lightning changes of thought' and therefore do not wish to be hampered by the cramping strait-jacket of prefixed Study Strategies.

Nonetheless it can be said that the variable viz ; Study Strategies (SS), has been found to differentiate between the adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity.

- 6.55. LOCUS OF CONTROL: The ^{results of the} significance of differences
 RESULTS between the mean scores on Locus
 of Control of adolescents with high
 Scientific Creativity, Mathematical Creativity, Entrepreneurial
 Creativity and General Creativity have been given in Table 6.18.

TABLE - 6.18

INTER GROUP DIFFERENCES AMONG ADOLESCENTS WITH HIGH SCIENTIFIC,
 MATHEMATICAL, ENTREPRENEURIAL AND GENERAL CREATIVITY WITH REGARDS
 TO LOCUS OF CONTROL

GROUPS		M ₁	SD ₁	M ₂	SD ₂	CR.
Adolescents with high Mathematical Creativity N ₁ = 120	Adolescents with high Scientific Creativity N ₂ = 120	8.66	2.90	7.37	3.03	** 3.31
Adolescents with high Mathematical Creativity N ₁ = 120	Adolescents with high Entrepreneurial Creativity N ₂ = 120	8.66	2.90	8.63	2.98	0.03
Adolescents with high Mathematical Creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	8.66	2.90	8.13	2.59	1.48
Adolescents with high Scientific Creativity N ₁ = 120	Adolescents with high Entrepreneurial Creativity N ₂ = 120	7.37	3.03	8.63	2.98	** 3.40
Adolescents with high Scientific Creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	7.37	3.03	8.13	2.59	** 5.85
Adolescents with high Entrepreneurial Creativity N ₁ = 120	Adolescents with high General Creativity N ₂ = 120	8.63	2.98	8.13	2.59	1.39

6.56. DISCUSSION OF ^{THE} RESULTS Out of the six critical ratios reported in the Table 6.18, three values are significant beyond .01 level of confidence. The following results can be crystallized from the Table :

- 1) The value of the critical ratio computed between the mean scores on Locus of Control of adolescents with high Mathematical Creativity is statistically significant, ($P < .01$), with the former group having a higher mean score than the latter. The results indicate that the adolescents with high Mathematical Creativity are significantly more external than the adolescents with high Scientific Creativity.
- 2) No significant difference has been found to exist between the mean scores on Locus of Control of the adolescents with high Mathematical Creativity and high Entrepreneurial Creativity. The results indicate that the two groups of adolescents cannot be differentiated on the basis of their scores on Locus of Control.
- 3) The difference between the mean scores on Locus of Control of adolescents with high Mathematical Creativity and high General Creativity is statistically insignificant. The results show that the two groups of adolescents cannot be differentiated on the basis of their scores on Locus of Control.
- 4) A significant difference has been found to exist between the adolescents with high Scientific Creativity and high Entrepreneurial Creativity with regards to their Locus of Control, with the latter group showing a higher mean score than the former. Thus, the adolescents with high Entrepreneurial Creativity are significantly more external than the adolescents with high Scientific Creativity.

5) The value of the critical ratio between the mean scores on Locus of Control of the adolescents with high Scientific Creativity and high General Creativity is statistically significant ($P < .01$) with the latter group having a higher mean score than the former. This shows that the adolescents with high General Creativity are significantly more external than the adolescents with high Scientific Creativity.

6) No significant difference has been found to exist between the mean scores on Locus of Control of the adolescents with high Entrepreneurial Creativity and high General Creativity. The results show that the two groups of adolescents cannot be differentiated on the basis of their mean scores on Locus of Control.

6.57. CONCLUSIONS

The following conclusions can be drawn on the basis of the above discussion :

1) The adolescents with high Mathematical Creativity have been found to possess more belief in external control (External Locus of Control) than the adolescents with high Scientific Creativity.

The adolescents highly creative in the field of mathematics are likely to perceive reinforcements as following some action of their own but not being entirely contingent upon their actions, indicating thereby an External Locus of Control.

2) The adolescents with high Entrepreneurial Creativity are significantly more external in their Locus of Control than the adolescents with high Scientific Creativity.

3) The adolescents with high general creativity have been found to have significantly more belief in external control (External Locus of Control) in comparison with the adolescents with high Scientific Creativity.

4) The adolescents with high Mathematical Creativity and adolescents with high Entrepreneurial Creativity ; adolescents

with high Mathematical Creativity and high General Creativity ; and the adolescents with high Entrepreneurial Creativity and high General Creativity, could not be differentiated on the basis of their mean scores on Locus of Control.

It can conclusively be said that among the four groups of highly creative adolescents, the group with high Mathematical Creativity are most significantly external, followed by the adolescents with high Entrepreneurial Creativity and adolescents with high General Creativity.

It is interesting to note that the adolescents with high scientific creativity have the lowest mean score on Locus of Control indicating thereby a tendency towards belief in internal control (Internal Locus of Control). It can thus be said that among the four groups of creative adolescents, the scientifically creative adolescents have 'relatively' most internal Locus of Control as compared to the adolescents with high Entrepreneurial, General and Mathematical Creativity with the last mentioned group showing maximum external Locus of Control.

The results of the present study also throw interesting light on the hitherto unexplored area of 'inter-group differences' among the adolescents with high creativity level in four different streams viz ; Science, Mathematics, Commerce and General field with regard to Locus of Control.

The Locus of Control has been found to be capable of differentiating to some extent between the adolescents with high Scientific, Mathematical, Entrepreneurial and General Creativity at the adolescent level. Among the four groups studied, adolescents with high Scientific Creativity have most internal Locus of Control while adolescents with Mathematical Creativity have been found to possess most 'External' locus. These results are somewhat new as little evidence of this type was available on adolescents talented in different fields.

6.58. COMPARATIVE PROFILES OF ADOLESCENTS WITH HIGH AND LOW ENTREPRENEURAL, SCIENTIFIC, MATHEMATICAL AND GENERAL CREATIVITY ON SOME SELECTED VARIABLES : GENERALIZATION AND DISCUSSION OF RESULTS

The following conclusions emerge after the analysis of the results and discussion on the profiles of adolescents creative in the fields of Commerce, Science and

Mathematics and General Field :

1) The adolescents with high Entrepreneurial Creativity, Scientific Creativity and General Creativity respectively have been found to possess significantly superior, 'healthy' 'positive' and 'warm' interpersonal relations with their parents, teachers, siblings and friends, than the adolescents with low Entrepreneurial, Scientific and Mathematical Creativity. This shows that the higher the creativity level in the above field, better the interpersonal relations.

The scores on Inter Personal Relations of the adolescents with high and low Mathematical Creativity could not, however, be found to differentiate between them. It indicates that the interpersonal relations of mathematically gifted adolescents may not be very good. However, symptomatic results in the case of their Total Interpersonal Relations indicate that the adolescents with high Mathematical Creativity are likely to have somewhat better and more positive Interpersonal Relations than their counterparts.

2) The adolescents with high Entrepreneurial Creativity, Scientific Creativity, Mathematical Creativity and General Creativity respectively have been found to excel their counterparts with low creativity on Intelligence. This indicates that the adolescents endowed with high creativity in the fields of science, commerce and mathematics and the general field also possess a high level of intelligence.

3) The adolescents with high and low Scientific, Mathematical, Entrepreneurial and General Creativity could not be differentiated on the basis of their scores on Locus of Control.

4) The adolescents with high Entrepreneurial and Scientific Creativity have been found to be significantly more capable of initiating 'novel', 'interesting' and 'creative' activities and completing them on their own as compared to the adolescents with low Entrepreneurial and Scientific Creativity.

The scores on Self-Initiated Activities could not however differentiate between the adolescents with high Mathematical and high General Creativity.

5) The adolescents with high Scientific, Mathematical, Entrepreneurial and General Creativity have been found to excel the adolescents with low Scientific, Mathematical, Entrepreneurial and General Creativity on achievement. Thus, the likelihood of finding highly creative adolescents in the streams of science, mathematics and commerce, and the general field from the high achieving group is very bright.

6) The adolescents with high Entrepreneurial creativity and high Mathematical Creativity have been found to be significantly superior to their counterparts with low Entrepreneurial and Mathematical Creativity with regard to General Creativity. This shows that the creative adolescents in the fields of Commerce and Mathematics are equally creative in fields not directly related to their own specific stream of study.

However, in the case of the scientifically creative adolescents, the only area wherein they were found to excel their counterparts with low creativity was with respect to Non-Verbal Creativity. Thus adolescents with high scientific creativity have been found to be endowed with high non-verbal creativity.

7) The Overall Study Habits with respect to Habits with Regard to Time and Duration; Mode of Study; Classroom Study; Planning the Study; Preparation for Examinations; Extra reading and Memorization of the adolescents with high Scientific Creativity, Entrepreneurial Creativity and General Creativity have been

found to be significantly superior to those of the adolescents with low Scientific Creativity, Entrepreneurial Creativity and General Creativity.

With the exceptions of Habits with Regard to Planning the Study and Memorization all the other dimensions of Study Strategies enumerated above were found to establish the superiority of the adolescents with high Mathematical Creativity over the adolescents with low Mathematical Creativity.

It can thus be concluded from the obtained results that the adolescents with high Entrepreneurial Creativity have been found to be significantly superior to the adolescents with low Entrepreneurial Creativity on all the selected key variables in the present study (Child-Parent Interpersonal Relations, Teacher-Pupil Interpersonal Relations, Siblings Interpersonal Relations, Friends Interpersonal Relations and Total Interpersonal Relations), Intelligence, Self Initiated Activities, Verbal Creativity, Non-Verbal Creativity, General Creativity, Achievement, Habits with Regard To Time And Duration; Habits With Regard to Mode of Study; Planning the Study; Preparation For Examinations; Classroom Study; Extra Reading. Memorization and Total Study Strategies respectively. The two groups of adolescents however, could not be differentiated of the basis of their scores on Locus of Control.

In the case of Scientific Creativity, it has been found that excepting on Locus of Control, Verbal Creativity, General Creativity and Habits With Regard To Memorization, on all the other selected variables enumerated above, the superiority of the adolescents with high Scientific Creativity over the adolescents with low Scientific Creativity is statistically established.

With the exceptions of the variables namely Total Interpersonal Relations (CPIR, TPIR, SIR, FIR); Locus of Control, Self Initiated Activities and Habits Regarding Planning and Memorization on which the adolescents with high and low Mathematical Creativity could not be significantly differentiated ; in all the

show that, the Indian adolescents, endowed with high and low creativity in various fields, by and large, are full of adventure and 'optimism', ^{are} 'bold', 'confident', 'active', 'dynamic', 'clear thinking', 'self-controlled', 'intelligent', etc. and their vocational aspirations are quite high (Engineer, Scientist, Doctor, IPS, Judge, Lawyer, Botanist, Fighter Pilot (Adolescents with high and 3 low Scientific Creativity); Chartered Accountant, Judge, Economist, Engineer, Lawyer, Pilot (Adolescents with high and low Entrepreneurial Creativity); Industrial Engineer, IAS Officer, IFS Officer, Scientist, Lawyer, Fighter Pilot, Air Force Officer, Doctor, Computer Programmer (Adolescents with high and low Mathematical Creativity); Engineer, Computer Programmer, Fighter Pilot, Doctor, IAS Officer, Film Director, Lawyer, Engineer, Chartered Accountant, Computer Technician (Adolescents with high and low General Creativity) and this happens to be a common feature of adolescents studying in Jammu City irrespective of the fact whether they are highly creative or not.

On the basis of the obtained results, it should become possible for the teachers, researchers and administrators to understand the career aspirations, dynamics of behaviour and personality structures of adolescents as a group.

The obtained results also amply justify the need for developing different tests of creativity to identify creative adolescents in different areas rather than in general field. The hypothesis of the investigators that the general tests of creativity may not be able to differentiate between adolescents gifted with different talents especially in the mathematical, entrepreneurial, scientific and general fields, has been established beyond any doubt, as clearly differentiated profiles of adolescents have been delineated as had been envisaged. Thus, the soundness of the basis rationale behind conducting the present investigation has been firmly proved.

The present results clearly indicate the need to develop special strategies for encouraging different kinds of creative talents among adolescents at the +2 stage of education and the need to develop different screening devices to identify adolescents gifted in different fields, besides the ones taken up in the present study, and tackling them in ways unique to each group.

The results of the present investigation corroborate the results reported by several other investigators regarding

(i) The positive relationship between creativity and intelligence (Phatak 1961, 62; Raina 1968; Trivedi 1969; Passi 1971; Sharma 1971; Sharma 1972, 1974; Azmi 1974; Bedi 1974; Goyal 1974; Joshi 1974; Kumari 1975; Dhaliwal and Saini 1976; Dutt et.al., 1977; Gakhar and Kaura 1977; Singh, Mathur and Saxena, 1977. Singh 1978; Patel and Joshi 1978; Badrinath and Satyanarayan 1979; Gulati 1979, Gupta 1979; Jarial 1979; Sandhu 1979; Jarial and Sharma 1980; Gakhar et. al; 1980; Chadha and Sen 1981);

(ii) The positive and significant relationship between scholastic achievement and creativity (Raina 1968; Trivedi 1979; Khire 1971; Lalithamma 1973; Bagga 1973; Bedi 1974; Jain 1975; Pandit 1976; Mehdi 1977; Singh, Mathur and Saxena 1977; Singh 1978; Awasthy 1979; D'Lina 1979; Gupta 1979; Masih 1979; Sandhu 1979; Asha 1980; Vijayalakshmi 1980; and Jarial 1981); (iii) Traits of Creative personality and/or perceived self images of highly creative and low creative adolescents (Singh 1971; Hindal 1969; Dallas and Gaire 1970; Roe, Taylor, Knapp, Cattell, Macurdy, McClelland, Eiduson, Chambers and Gough reported by Barron 1968; Mackinnon 1962; Dudek 1962, 1970, 1970 a; Khatena 1976; Khatena and Raina 1977; Raina 1968; Lalithamma 1973; Verma 1973; Goyal 1974; Joshi 1974; Kumar 1978; Singh 1980; Bhan 1973; Gakhar 1975; Nair 1976; Gupta 1977; Mallapa and Upadhyaya 1977; Jha 1975; Gopal 1975; Bharadwaj and Gupta 1981; Mc Alpine 1972; Aaron and Malatesha). (iv) Vocational preferences of adolescents (Krishnan 1956; Grunes 1956; Rosenberg 1957; Sharma 1958; Pandey 1963; Hilton et. al., 1970; Sinha and Dash 1959; Cook 1962;

Singh and Prasad, Razler 1963, and Bhan 1973), and contradict the results of Paramesh and Narayan 1974; Bhan 1973; Singh and Mehra 1981) who reported that the vocational interests of the highly creative people are vastly different from those of their counterparts with low creativity; (Verma 1980), who reported that the highly creative were internal on Locus of Control.

However, some of the results of the present investigation do provide evidence of contradicting natures regarding the profiles of adolescents with high creativity.

Generally, highly creative individuals are held to be 'absentminded', 'sloppy', 'indifferent' and 'idiosyncratic'. The present results on the Interpersonal Relations (Child-Parent, Teacher-Pupil, Siblings and Friends Interpersonal Relations) of the adolescents endowed with high Entrepreneurial, Scientific and General Creativity, interestingly show that these adolescents have 'warm', 'positive' and 'healthy' interpersonal relations. In the case of the adolescents with high mathematical creativity however, it was found that their interpersonal relations are somewhat inferior to those of their counterparts with high scientific entrepreneurial and general creativity.

The variable of Locus of Control was found to be incapable of differentiating between adolescents with high and low Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity thereby indicating that Locus of Control may not be a differentiating variable between the adolescents with high and low creativity at the +2 stage. On the other hand Locus of Control may prove to be so during later or mature years.

Creative people are normally held to be 'disorganized', and known to tackle their work in 'spurts' and 'jerks'. However the results of the adolescents highly creative in the fields of Science, Mathematics, Commerce and General fields with regards to their Overall Study Habits, provide convincing evidence to the effect that the creative adolescents, Scientists, Entrepreneurs,

adolescents with high General Creativity and the creative mathematicians) are fully capable of chalking out 'organized', 'systematic', and detailed strategies for dealing effectively with their academic work load. even though the adolescents with high mathematical creativity have somewhat inferior study habits as compared to their counterparts with high creativity in other spheres.

An interesting feature of the results obtained in the present investigation happens to be the fact that factor of Intelligence has proved to be a differentiating factor at different levels and types of creative talent. On the basis of the present results, the adolescents with high Mathematical Creativity were found to excel the other three creative groups on Intelligence, (followed by the adolescents with high Scientific Creativity, adolescents with high General Creativity and adolescents with high Entrepreneurial Creativity).

Analysis of the data indicate that we can extend the threshold hypothesis first put forward by Getzels and Jackson (1951) whereby, intelligence creativity relationship and differentiation can be understood. It appears that at different intelligence levels above the minimum threshold level of intelligence required for emergence of creativity, different creative abilities manifest themselves. While entrepreneurial creativity can be identified first, at higher levels scientific creativity can be distinguished. Mathematical Creativity however seems to blossom at higher levels of intelligence. No wonder the mathematically creative adolescents do not have very superior study strategies and interpersonal relations, since they seem to derive their basic inspiration and satisfaction from the insights and flashes rather than sheer hard work and memorization, and ^{they} are also somewhat erratic or poor in their interpersonal relations.

The above result brings to light the need to identify, nurture and monitor the creative talents of ^{the} individuals endowed with mathematical talent and organise remedial and guidance

programmes right from their early childhood. We are, to some extent familiar with creative thinking and behaviour of creative artists/musicians/scientists etc. but not much is known about creative mathematicians who have by and large, remained neglected. However the recent attempts at organizing 'Mathematical Olympiads', 'National Talent Searches' etc. are praiseworthy though tentative attempts in this direction.

The results of the present investigation do provide a convincing answers to the basic questions posed in the present study namely (a) "What distinguishes a creative adolescents talented in one field from another adolescent talented in another field?" (b) In what ways are adolescents endowed with creativity in the field of science, mathematics, commerce and general fields similar and different from each other?". (c) "How do adolescents with high and low creativity in the fields of science, commerce and general fields differ from each other when compared vis-a-vis some selected psycho-socio-educational factors?".

As the result of the data presented in the Chapter inter-group profiles of adolescents gifted with scientific creativity, mathematical creativity, entrepreneurial creativity and general creativity have emerged which can, in all humility, be claimed to be a significant contribution to our limited knowledge on the subject.

Last but not the least, the results obtained in the present investigation, do provide a convincing evidence of the validity of the newly developed batteries of (i) Tests of Scientific Creativity (ii) Tests of Entrepreneurial Creativity and (iii) Tests of Mathematical Creativity. It is hoped that the availability of these batteries of creativity tests would prove helpful to prospective researchers to launch several investigations in future years to identify and study the adolescents with different talents at the +2 stage of education.

**6.59. INTER GROUP DIFFERENCES IN
PROFILES OF ADOLESCENTS WITH HIGH
SCIENTIFIC, MATHEMATICAL, ENTREPRE-
NEURAL AND GENERAL CREATIVITY:
CONCLUSIONS**

The following conclusions
can be crystallized on
the basis of the discussion
of the results given in
Tables 6.13, 6.14, 6.15,

and 6.16, 6.17 and 6.18 respectively. Graphs numbered 6.1 to 6.6
highlight the major trends in the results.

1) The "Overall Interpersonal Relations" (Child-Parent Interpersonal Relations, Teacher-Pupil Interpersonal Relations, Siblings Interpersonal Relations and Friends Interpersonal Relations) of the adolescents with high Scientific Creativity are the most superior, followed by adolescents with high Entrepreneurial Creativity and adolescents with high General Creativity. Among the four groups of adolescents creative in the streams of Science, Commerce, Mathematics and General field, the adolescents with high Mathematical Creativity have been found to possess the poorest interpersonal relations.

2) In the field of "Academic Achievement", the adolescents with high Mathematical Creativity have been found to be the highest achievers, followed by the adolescents with high Scientific Creativity and the adolescents with high General Creativity. The adolescents with high Entrepreneurial Creativity have emerged as the poorest achievers among the four creative groups of adolescents.

3) The present study conclusively reveals that the level of "Intelligence" of the adolescents endowed with high Mathematical Creativity is the highest among the four groups of creative adolescents, followed by adolescents with high Scientific Creativity and high General Creativity. The group with high Entrepreneurial Creativity has been found to possess the lowest level of Intelligence when compared with their counterparts with high Mathematical, Scientific and General Creativity.

- 4) Out of the four groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity, the adolescents with high Entrepreneurial Creativity have been found to possess maximum capacity for initiating novel, interesting and creative activities and completing them on their own. This group is followed by the groups of adolescents with high Mathematical Creativity and adolescents with high General Creativity. The adolescents with high Scientific Creativity have been found to possess least capacity for initiating and completing novel, interesting and creative activities.
- 5) Among the four groups of adolescents endowed with high creativity in the fields of Science, Mathematics, Commerce and General fields, the adolescents with high Entrepreneurial Creativity have been found to possess the best "Study Habits" or "Study Strategies", followed by the adolescents with high General Creativity and adolescents with Scientific Creativity. The adolescents with high Mathematical Creativity have been found to possess the lowest mean score on Study Strategies in comparison to the other three groups of creative adolescents.
- 6) Among the four groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity, the adolescents with high Mathematical Creativity are most significantly 'External' on 'Locus of Control'. They are followed by the adolescents with high General Creativity and the adolescents with high Entrepreneurial Creativity. Adolescents with high Scientific Creativity have been found to possess relatively internal Locus of Control.

In conclusion it can be said that out the four groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity, the adolescents with high Scientific Creativity have the best Interpersonal Relations, have relatively internal on Locus of Control ; the adolescents with high Mathematical Creativity are the highest achievers academically and possess the highest level of Intelligence and

are most significantly external on Locus of Control. The adolescents with high Entrepreneurial Creativity have the best Study Habits and possess maximum capacity to initiate and complete novel and interesting activities.

7) The adolescents with high entrepreneurial creativity have been found to perceive themselves in terms of adjectives namely ; 'Active', 'Confident', 'Clear Thinking', 'Practical', 'Sensitive', 'Systematic', 'Self-Controlled', 'Frank', 'Bold', 'Atheist' and 'Modest'. By and large they have perceived themselves in terms of 'positive', 'energetic', and 'dynamic' images which are indicative of 'balanced', 'well adjusted' personality structures.

8) The perceived self-images of the adolescents with high Scientific Creativity can be described in terms of the adjectives viz ; 'Active', 'Brave', 'Cheerful', 'Confident', 'Clear Thinking', 'Graceful', 'Noble', 'Self-Controlled', 'Conservative' and 'Sensitive'.

The perceived self-images of these adolescents are ^{mostly} positive and convey robustness dynamism and vitality. The group of highly creative adolescents in the stream of science is characterised by greater self acceptance high sense of personal well being, and societal adjustment and an appreciable degree of self-confidence.

9) The adolescents with high Mathematical Creativity have perceived themselves in terms of the images viz ; 'Responsible', 'Noble', 'Punctual', 'Brave', 'Clear Thinking', 'Graceful', 'Self-Controlled', 'Strong', 'Sensitive', 'Practical', 'Serious' and 'Conservative'.

While the above self-images (as a whole) cannot exactly be characterised as being 'dynamic' 'energetic' and 'forceful'; they, can certainly be called 'positive', 'healthy' and

'realistic', indicative thereby, of optimistic attitude towards life, a good sense of self worth, and a balanced disposition.

10) The adolescents endowed with high General Creativity have been found to perceive themselves in terms of adjectives like 'Active', 'Confident', 'Disciplined', 'Clear Thinking', 'Cheerful', 'Fair minded', 'Happy', 'Responsible', 'Conservative' and 'Sensitive'.

While the above self-images are 'positive' and 'optimistic', they also indicate the presence of high self-acceptance strong self-sentiment and well adjusted personality structure.

11) The results show that, on the whole, considerable overlapping is present among the self-images of adolescents with high Scientific, Mathematical, Entrepreneurial and General Creativity.

While the groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity have perceived themselves as being, 'Clear Thinking' and 'Sensitive', other adjectives which are commonly found in the self-images of different groups are 'Active' and 'Confident' (Adolescents with high Entrepreneurial Creativity, Scientific Creativity and General Creativity), 'Practical' (Adolescents with high Entrepreneurial and Mathematical Creativity) ; 'Brave', 'Graceful' and 'Noble' (Adolescents with high Scientific and Mathematical Creativity); 'Self Controlled' (Adolescents with high Entrepreneurial, Scientific and Mathematical Creativity); 'Cheerful' (Adolescents with high General and Scientific Creativity); 'Conservative' (Adolescents with high Scientific, Mathematical and General Creativity); ^{and} 'Responsible' (Adolescents with high Mathematical and General Creativity).

12) The adjectives which have been observed to be exclusive to the self-images of the group of adolescents with high Mathematical Creativity are ; 'Punctual', 'Strong', and 'Serious'.

The adjectives which have been found to differentiate the self-images of adolescents with high General Creativity from the group of adolescents with high Scientific Creativity, group of adolescents with high Entrepreneurial Creativity and the adolescents with high Mathematical Creativity are ; 'Disciplined', 'Fair minded', and 'Happy'.

The adjectives which have been found to be exclusive to the self-images of the group of adolescents with high Entrepreneurial Creativity are ; 'Systematic', 'Frank', 'Bold', 'Modest', and 'Atheist'.

No adjective in the perceived self-images of the adolescents with high Scientific Creativity was found to be exclusive to this particular group.

13) The adolescents with high Entrepreneurial Creativity have been found to show ^{marked} preference for the vocations namely ; 'Bank Cashier', 'Bank Officer', 'Chartered Accountant', 'Lecturer', 'Judge', 'Economist', 'Army Officer', 'Engineer', 'Poet' and 'Musician'.

It can be said that the vocational choices of these adolescents are realistic in nature and in accordance with their stream of study. At the same time, the group of adolescents with high Entrepreneurial Creativity have been found to exhibit qualities of 'Courage', 'risk taking' and 'dynamism' in their vocational choices, qualities which are associated with the creative process and creative thinking.

14) The adolescents with high Mathematical Creativity have been found to prefer the vocations viz ; 'Industrial Engineer', 'Air Force Officer', 'IAS Officer', 'IFS Officer', 'Scientist', 'Lawyer', 'Accountant', 'Lecturer', 'Fighter Pilot' and 'Bank Officer'.

The adolescents with high Mathematical Creativity have been found to be chiefly motivated by the status and prestige

involved with different vocations. Their vocational choices reveal a lack of maturity and awareness on their part. This may account for their somewhat unrealistic and inconsistent preferences. However it is quite possible that the fault lies not with our mathematically creative minority, but with the policy planners and educational administrators and ^{is due to} the utter lack of constructive educational and vocational guidance, programme at the school level especially at the +2 level of education.

15) The adolescents with high Scientific Creativity have shown preference for the vocations namely ; 'Scientific', 'Doctor', 'Engineer', 'IPS Officer', 'Fighter Pilot', 'Army Officer', 'Judge', 'Lecturer', 'IFS Officer', 'Air Force Officer' and 'Lawyer'.

The observed results show that, to a large extent, the vocational preferences of the adolescents with high Scientific Creativity are 'realistic', 'consistent' and attainable.

However, some vocational choices seem to be chiefly motivated by their social status and may be ^{made} ~~due~~ ^{to} incomplete awareness and lack of maturity on the part of the scientifically creative adolescents.

16) The adolescents with high General Creativity have shown preference for the vocations viz ; 'Engineer', 'Computer Programmer', 'Fighter Pilot', 'Doctor', 'IFS Officer', 'Film Director', 'Lecturer', 'Lawyer', 'Accountant' and 'Air Force Officer'.

The vocations chosen by the adolescents with high General Creativity are high in status and prestige. At the same time, these vocations have been found to possess a greater range and diversity, indicating the presence of a reasonably good awareness of the world of work on the part of the adolescents with high General Creativity.

17 a) The present results indicate that all the four groups of adolescents endowed with Scientific, Mathematical, Entrepreneurial and General Creativity have chosen the vocations viz ; 'Lecturer' and 'Engineer'. It is indeed heartening to observe that the vocation of 'Teaching' (considered as traditional passive vocation and low in status value by conventional standards) rates among the top ten vocational preferences of our highly creative adolescents in the streams of Science, Mathematics and Commerce and General fields.

b) The vocations which have been jointly checked out by the adolescents with high Entrepreneurial Creativity and adolescents with high Scientific Creativity are 'Judge' and 'Army Officer'.

Both groups seem to have been influenced by what can be described as 'the glamour of the uniform'.

c) The vocation of a 'Bank Officer' has been checked out jointly by the adolescents with high Entrepreneurial Creativity and adolescents with high Mathematical Creativity.

While this choice seems realistic in the case of the former group ; in the latter case it indicates a tendency to underestimate the limits of creative potential and link it with clerical, managerial or numerical aptitude.

d) The adolescents with high Mathematical Creativity, the adolescents with high Scientific Creativity and the adolescents with high General Creativity have jointly checked out the vocations viz ; 'Air Force Officer', 'Lawyer' and 'Fighter Pilot'.

It can be presumed from the above similarities in vocational preferences that these adolescents are of a 'dynamic' 'vital' and 'forceful' disposition (which is confirmed from their perceived self-images).

e) The adolescents with high Mathematical Creativity and the adolescents with high General Creativity have jointly shown preference for the vocations viz; 'IAS Officer' and 'accountant'.

These choices though realistic in both cases, are quite different where their status value is concerned.

f) The vocations of 'IFS Officer' and 'Scientist' have been checked out by the adolescents with high Mathematical Creativity and high Scientific Creativity. These choices can be considered to be well within the productive and creative resources of the two groups even though the first choice seems to be related to glamour or social prestige.

g) The adolescents with high Scientific Creativity and the adolescents with high General Creativity have exhibited a 'realistic' career aspiration in their joint choice of the vocation of a 'Doctor'.

h) The vocational choices which are exclusive to the group of adolescents with high Entrepreneurial Creativity are ; 'Bank Cashier', 'Chartered Accountant', 'Economist', 'Poet' and musician. The last two vocations do not seem to be linked with their stream of study but reflect the presence of talents which are characteristic of artistic creative ability.

i) The vocational choices which differentiate the adolescents with high General Creativity from their counterparts with high Creativity in the fields of Mathematics, Commerce and Science are ; 'Computer Programmer' and 'Film Director'.

j) The sole vocational choice which has been observed to be exclusive to the group of adolescents with high Scientific Creativity is their choice of the vocation viz; 'IFS Officer'.

k) All the top ten vocational choices of the adolescents with high Mathematical Creativity overlap with one or other choices checked out by the adolescents in the remaining three groups.

This result brings to light two revealing facts :

i) Adolescents with high Mathematical Creativity have much in common with their counterparts endowed with high Scientific Creativity, Entrepreneurial Creativity and high General Creativity with reference to Vocational Preferences.

ii) The adolescents endowed with high Scientific Creativity, Entrepreneurial Creativity, and high General Creativity have retained some measure of independence ^{and uniqueness} in their vocational preferences, which does not seem to be the case among the adolescents with high Mathematical Creativity.

A convincing evidence has been furnished in the present study ^{about} the consistency among the vocational choices and the perceived self-images of the adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity. This shows that the creative personality (irrespective of ^{the} field/area/stream/specifics) in 'holistic' and 'homogenous' in its basic structure.

CHAPTER SEVEN

PREDICTION OF CREATIVITY
FROM SELECTED VARIABLES

7.1. One of the important objectives of the present investigation happened to be the prediction of creativity level of adolescents, at the +2 stage, on the basis of their scores on some key variables selected for the current study. Such an exercise, it was thought could prove handy in the task of predicting scientific, mathematical, entrepreneurial and overall creativity levels from the common denominators provided by scores on the variables. In the present chapter, results of Multiple Regression Analysis have been reported along with a discussion of their results.

7.2. MULTIPLE LINEAR
REGRESSION : INTRODUCTION

Multiple linear regression can be described as a statistical technique of extending simple

linear regression in such a manner, that it includes more than two independent variables for prediction purposes (Yamane and Taro, 1970). This technique is frequently used in business, economic and educational research problems, as, a large number of variables can be taken up especially with the availability of electronic data processing facilities available. According to Kurtz and Mayo (1980) the multiple regression equation provides the best possible way to predict the scores on the basis of knowledge of an individual's score on several variables. The general form of this equation is;

$$\bar{Y} = A + b_1 X_1 + b_2 X_2$$

where X and Y are observed scores, A is a constant, a number computed from the sample data, b_1 is the coefficient representing the weight given to the scores in the distribution X_1 in the regression equation, b_2 is the partial regression coefficient which represents the weight given to the

scores in the distribution Y_2 in the regression equation and is computed from the sample data, \bar{Y} in the value of Y estimated from the scores in the distribution X_1 and X_2 by using the regression equation.

Since in the present investigation, scores on as many as five variables were employed for predicting the creativity level, the multiple regression equation was extended as follows :

$$\bar{Y} = A + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 \dots$$

where \bar{Y} the creativity score of a particular individual from his scores on variables X_1 X_2 X_3 X_4 and X_5 by using regression equation.

Three separate sets of regression equations one each for predicting the scores on scientific creativity, entrepreneurial creativity and mathematical creativity respectively, were employed. This was followed by working out the errors of estimation. Also, the regression equations in the standard score forms, were also derived. In this case, the value of beta coefficients (B)s were worked out. Beta coefficients represented the population values corresponding to the sample values.

A pertinent question in multiple regression analysis pertains to the usefulness or the effectiveness of the equation for estimation/prediction purpose. Many times, use of a number of terms and great deal of computations may still be useless (Walker and Lev, 1965). Another question which arises in regression is that, if the equation is employed to predict the scores derived from another random sample or on any other occasion, how effective would be the prediction. For the former coefficients of correlation between the observed scores of different types of creativity and scores predicted for creativity by multiple regression equations were worked out. These correlations are known as "coefficient of multiple correlations" or "multiple correlation coefficient" (denoted by the symbol R). Also, analysis of variance was carried out to single out the

proportion of variance due to regression. The final results were interpreted in terms of significance level of the multiple correlations coefficients.

7.3. MULTIPLE REGRESSION DESIGN In the present analysis the predictor variables were

- 1) Scores On Things Done On Your Own Checklist
- 2) Locus of Control
- 3) Academic Achievement
- 4) Intelligence
- 5) Study Habits
- 6) Total Interpersonal Relations

The predicted variables were; (a) Scores on Mathematical Creativity (b) Scores on Scientific Creativity (c) Scores on Entrepreneurial Creativity (d) Scores on General/Overall Creativity.

7.4. REGRESSION ANALYSIS : RESULTS The results of the Multiple Regression Analysis are given in Tables 7.1 to 7.12.

TABLE - 7.1 (SCIENTIFIC CREATIVITY)

Analysis of Variance			
	DF	Sum of Squares	Mean Square
Regression	6	1353.18649	225.53108
Residual	113	30262.28017	267.80779
<hr/>			
Multiple R	.20689		
R Square	.04280		
Adjusted R Square	-.00802		
Standard Error	16.36483		
R Square Change	.04280		
F Change	.84214		
Signif F Change	.5400		

TABLE - 7.2 (PART A) SCIENTIFIC CREATIVITY

Var-Covar Matrix of Regression Coefficients (B)

*Variables	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
X ₁	.04306	.06801	-.07472	.10079	-.13146	.05824
X ₂	.00152	.01066	.02852	.06196	-.05453	-.16717
X ₃	-.00464	8.4356E-04	.08208	.03480	-.03364	.12084
X ₄	.00179	5.2401E-04	8.1682E-04	.00671	.11013	-.08787
X ₅	-8.135E-04	-1.606E-04	-2.749E-04	2.5738E-04	8.1376E-04	.11302
X ₆	.00650	-.00887	.01780	-.00370	.00166	.26442

* X₁ = Things Done On Your Own ChecklistX₂ = IntelligenceX₃ = AchievementX₄ = Study StrategyX₅ = Total Interpersonal RelationsX₆ = Locus of Control

(PART - B)

XTX Matrix	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	Y*
X ₁	1.05531	.07128	-.07800	.10586	-.13896	.06224	.05012
X ₂	.07128	1.04078	.02957	.06462	-.05725	-.17740	-.15228
X ₃	-.07800	.02957	1.03260	.03615	-.03518	.12773	-.03171
X ₄	.10586	.06462	.03615	1.04525	.11586	-.09345	-.08051
X ₅	-.13896	-.05725	-.03518	.11586	1.05333	.12097	-.04043
X ₆	.06224	-.17740	.12773	-.09345	.12097	1.08200	-.06973
Y	-.05012	.15228	.03171	.08051	.04043	.06973	.95720

* Scientific Creativity

TABLE - 7.3 (SCIENTIFIC CREATIVITY)

Variables	B	SE B	95% Confidence Interval B	Beta	SE Beta	
X ₁	-.11499	.21693	-.54478	.31479	-.05012	.09455
X ₂	.16743	.10323	-.03710	.37195	.15228	.09389
X ₃	.09714	.28649	-.47045	.66473	.03171	.09353
X ₄	.07010	.08193	-.09221	.23241	.08051	.09410
X ₅	.01218	.02853	-.04434	.06869	.04043	.09471
X ₆	.37451	.51422	-.64425	1.39327	.06973	.09574
Constant	74.45954	27.35061	20.27304	128.64603		
Correlation	Part Cor.	Partial	Tolerance	T	Sig. T	
-.06970	-.04879	-.04981	.94759	-.530	.5971	
.16386	.14927	.15082	.96081	1.622	.1076	
.00622	.03121	.03188	.96843	.339	.7352	
.08066	.007875	.08023	.95671	.856	.3940	
.01790	.03929	.04012	.94440	.427	.6703	
.09955	.06703	.06835	.92421	.728	.4679	
				2.722	.0075	

Table - 7.4 (MATHEMATICAL CREATIVITY)

Analysis of Variance				
	DF	Sum of Squares	Mean Square	
Regression	6	1114.04173	185.67362	
Residual	113	18660.32494	165.13562	
Multiple R	.23736	R Square Change	.05634	
R Square	.05634	F Change	1.12437	
Adjusted R Square	.00623	Signif F Change	.3527	
Standard Error	12.85051			

Table - 7.5 (PART - A) MATHEMATICAL CREATIVITY

Var-Covar Matrix of Regression Coefficients (B)

*Variables	X_1	X_2	X_3	X_4	X_5	X_6
X_1	.01644	.00550	-.06107	.14316	.09062	-.11473
X_2	5.9366E-05	.00709	.07510	.12692	-.10035	.07155
X_3	-1.627E-04	1.3143E-04	4.3192E-04	-.4474	.15437	.29079
X_4	.00768	.00447	-3.889E-04	.17493	-.13603	.03439
X_5	9.2363E-04	-6.715E-04	2.5502E-04	-.00452	.00632	.00994
X_6	-.00126	5.1412E-04	5.1569E-04	.00123	6.7429E-05	.00728

* X_1 = Things Done On Your Own Checklist* X_2 = Intelligence* X_4 = Locus of Control* X_5 = Study Strategy

TABLE - 7.5 (PART - B)

XIV Matrix							
	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	Y*
X ₁	1.05164	.00574	-.06660	.15133	.09606	-.12401	-.13595
X ₂	.00574	1.03514	.08125	.13310	-.10551	.07673	-.12088
X ₃	-.06660	.08125	1.13075	-.04904	.16967	.32591	-.01791
X ₄	.15133	.13310	-.04904	1.06250	-.14493	.03736	.08968
X ₅	.09606	-.10551	.16967	-.14493	1.06845	.01083	-.01074
X ₆	-.12401	.07673	.32591	.03736	.01083	1.11090	.10669
Y*	.13595	.12088	.01791	-.08968	.01074	-.10669	.94366

TABLE - 7.6 (MATHEMATICAL CREATIVITY)

* Mathematical Creativity

Variables	B	SE B	95% Confidence Interval B	Beta	SE Beta
X ₁	.18600	.12822	-.06802	.13595	.09371
X ₂	.10948	.08420	-.05734	.12088	.09298
X ₃	3.82950E-03	.02078	-.03734	.01791	.09717
X ₄	-.39818	.41825	-1.22680	-.08968	.09420
X ₅	9.038279E-03	.07949	-.14845	.01074	.09446
X ₆	-.09452	.08953	-.26358	-.10669	.09632
Constant	93.57597	15.55043	62.76776		

Correlation	Part Cor.	Partial	Tolerance	T	Sig. T
.13726	.13257	.13521	.95090	1.451	.1496
.13420	.11881	.12140	.96605	1.300	.1962
.03877	.01684	.01733	.88437	.184	.8545
-.11692	-.08700	-.08920	.94118	-.952	.3431
-.01007	.01039	.01070	.93594	.114	.9097
-.09733	-.10122	-.10364	.90017	-1.108	.2704
Constant				6.018	.0000

TABLE - 7.7 (ENVIRONMENTAL CREATIVITY)

Analysis of Variance			
	DF	Sum of Squares	Mean Square
Regression	6	3037.08306	506.18051
Residual	113	29962.11694	265.15148
Multiple R			
R Square			.09204
Adjusted R Square			1.90902
Standard Error			.0853

Var-Covar Matrix of Regression Coefficients (B)

*Variables	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
X ₁	.03389	.00290	.02314	-.03827	-.05270	.12152
X ₂	2.7161E-04	.25848	-.03178	.09186	.07536	.09074
X ₃	7.1741E-04	-.00272	.02837	.00980	-.15288	-.32386
X ₄	-1.476E-04	9.7866E-04	3.4598E-05	4.3910E-04	-.25846	-.06264
X ₅	-9.721E-04	.00384	-.00258	-5.427E-04	.01004	.02056
X ₆	.00150	.00309	-.00366	-8.795E-05	1.3806E-04	.00449

*X₁ = Things Done On Your Own ChecklistX₂ = Locus of ControlX₃ = AchievementX₄ = Total Interpersonal RelationsX₅ = IntelligenceX₆ = Study Strategy

(PART - B)

XTX Matrix

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	Y*
X ₁	1.02364	.00298	.02512	-.04056	-.05633	.13212	-.20484
X ₂	.00298	1.02929	-.03461	.09761	.08079	.09893	.00647
X ₃	.02512	-.03461	1.15174	.01102	-.17336	-.37350	-.02585
X ₄	-.04056	.09761	.01102	1.09690	-.28602	-.07050	-.06939
X ₅	-.05633	.08079	-.17336	-.28602	1.11640	.02335	.08023
X ₆	.13212	.09893	-.37350	-.07050	.02335	1.15480	.19123
Y*	.20484	-.00647	.02585	.06939	-.08023	-.19483	.90796

TABLE - 7.9 (ENTREPRENEURIAL CREATIVITY)

Variables	B	SE B	95% Conf. Intvl.	B	Beta	SE Beta
X ₁	.41578	.18409	.05107	.78049	.20484	.09069
X ₂	-.03614	.50841	-1.04339	.97110	-6.465E-03	.09094
X ₃	.04526	.16842	-.28842	.37893	.02585	.09620
X ₄	.01549	.02095	-.02603	.05700	.06939	.09388
X ₅	-.08488	.10021	-.28341	.11365	-.08023	.09471
X ₆	-.13303	.06701	-.26579	-2.70590E-04	-.19123	.06633
Constant	82.07562	14.57018	53.20947	110.94177		

Correlation	Part. Cor.	Partial	Tolerance	T	Sig. T
.22701	.20246	.20783	.97690	2.259	.0258
.01122	-.00637	-.00669	.97154	-.071	.9434
-.05814	.02409	.02527	.86825	.269	.7886
.04362	.06625	.06936	.91166	.739	.4614
-.005473	-.07593	-.07943	.89574	-.847	.3988
-.20756	-.17795	-.18358	.86595	-1.985	.0495
				5.633	.0000

TABLE - 7.10 (GENERAL CREATIVITY)

Analysis of Variance			
	DF	Sum of Squares	Mean Square
Regression	6	3686.03338	614.35556
Residual	113	552153.33329	461.53392
Multiple R		.25693	
R Square		.06601	
Adjusted R Square		.01642	
Standard Error		21.48334	
		R Square Change	.06601
		F Change	1.33112
		Signif. F Change	.2491

TABLE - 7.11 (PART - A)

Var-Covar Matrix of Regression Coefficients (B)

*Variables	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
X ₁	.05567	.04564	-.07829	-.14710	-.13431	-.11807
X ₂	.00192	.03172	.00142	-.01443	.02285	-.22953
X ₃	-.00121	.00118	.00429	.09338	.24948	.06888
X ₄	-.02699	-.00200	.00276	.60447	-.01852	.12926
X ₅	-.00440	5.6557E-04	.00227	-.00200	.01931	-.02484
X ₆	-8.630E-04	-.00127	1.3982E-04	.00311	-1.069E-04	9.5955E-04

*X₁ = Things Done On Your Own Checklist*X₂ = Achievement*X₃ = Study Strategy*X₄ = Locus of Control*X₅ = Intelligence*X₆ = Total Interpersonal Relations

TABLE - 7.11 (PART - B) GENERAL CREATIVITY

XTX Matrix										
	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	Y*			
X ₁	1.05525	.04855	-.08430	-.15447	-.14396	-.12679	-.08834			
X ₂	.04855	1.07226	.11008	-.01528	.02469	-.24845	-.03323			
X ₃	-.08430	.11008	1.09852	.10005	.27283	.07547	-.12997			
X ₄	-.15447	-.01528	.10005	1.04497	-.01975	.13812	.15500			
X ₅	-.14396	.02469	.27283	-.01975	1.08870	-.02709	-.13855			
X ₆	-.12679	-.24845	.07547	.13812	-.02709	1.09265	.06147			
Y*	.08834	.03323	-.12997	.15500	-.13855	.06147	.93399			

* General Creativity

TABLE - 7.12 (GENERAL CREATIVITY)

Variables	B	SE B	95% Conf. Intvl.	B	Beta	SE Beta
X ₁	.22319	.23595	-.24428	.69065	.08834	.09339
X ₂	.06287	.17810	-.28997	.41572	.03323	.09414
X ₃	-.08938	.06553	-.021921	.04044	-.12997	.09529
X ₄	1.29669	.77748	-.24363	2.83702	.15500	.09294
X ₅	-.20295	.13895	-.47823	.07234	-.13855	.09486
X ₆	.02004	.03098	-.04133	.08140	.06147	.09503
Constant	75.76166	20.14628	35.84824	115.67507		

Correlation	Part. Cor.	Partial	Tolerance	T	Sig. T
.09232	.08600	.08863	.94764	.946	.3462
.05812	.03210	.03319	.93261	.353	.7247
-.11591	-.12401	-.12727	.91031	-1.364	.1753
.16371	.15163	.15500	.95697	1.668	.0981
-.08273	-.13279	-.13612	.91853	-1.461	.1469
.06545	.05881	.06074	.91521	.647	.5191
				3.761	.0003

7.5. DISCUSSION OF RESULTS (SCIENCE GROUP)

Tables 7.1, 7.2 and 7.3 represent the different steps in working out of the Multiple Regression Equation for predicting the scores of Scientific Creativity from the scores on Things Done On Your Own Checklist, Academic Achievement, Study Habits, Locus of Control, Intelligence and Interpersonal Relations respectively. The value of the Multiple Correlation (Multiple R), and F-ratio based on the Analysis of Variance between the Mean Squares due to 'Regression' and the 'Residual' effects have been given in Table 7.1 and are significant. This shows that, the regression effect is significant. Table 7.2 contains the variance covariance Matrix of Regression Coefficients. While the Correlation Coefficients have been given above the diagonal, the values below the diagonal represent the covariance values. This matrix was further utilised to derive the XTX Matrix from which the values of the Beta Coefficients were computed. The values of Regression Weights, The Standard Error of Regression Weights, The Confidence Intervals for the Regression Weights, Beta Coefficients, Standard Error of the Beta Coefficients Correlations, Partial Correlations, Tolerance Limits for the Partial Correlations, have all been represented in Table 7.3.

From Table 7.3 it is possible to derive the Regression Equation involving the scores on the six variables in the raw score form as well as in the standard score form. The two equations are given as under :

Raw Scores Form

\bar{Y}

$$\text{Scientific Creativity} = (-).11499X_1 + .16743X_2 + .09714X_3 \\ + .07010X_4 + .01218X_5 + .3451X_6 + 74.45954$$

Where,

\bar{Y} = Score of an adolescent on Scientific Creativity predicted from the variables taken for regression analysis,

X_1 = Score of the individual on Things Done On Your Own Checklist,

X_2 = Score of the individual on Intelligence,

X_3 = Score of the individual on Achievement,
 X_4 = Score of the individual on Study Strategy,
 X_5 = Score of the individual on Interpersonal Relations (Overall),
 X_6 = Score of the individual on Locus of Control
 74.45954 = Value of the constant.

The extent to which predictions based on the regression equation are likely to be reliable is given by the value of Multiple R which is .2068. The value is significant and indicative of moderately low reliability.

Standard Score Form

The Regression Equation in the standard score form is given by the expression :

$$\bar{Y} = (-) .05012\bar{X}_1 + .15228\bar{X}_2 + .03171\bar{X}_3 + .08051\bar{X}_4 + .04043\bar{X}_5 + .06973\bar{X}_6$$

Where, symbols have their previous meanings. The bars on the letters $X_1, X_2, X_3, X_4, X_5, X_6$ indicate scores in standard score form.

It can be noticed that in the Regression Equation, while five of the six variables namely Intelligence, Academic Achievement, Study Strategy, Interpersonal Relations and Locus of Control are contributing positively to the predicted score, the variable namely Things Done On Your Own Checklist contributes negatively to the same. The present results indicate that the derived regression equation in the standard score form accounts for 95% of the general creativity level (leaving almost 5% as residual). So, a crude estimate of scientific creativity score can be obtained from the scores on the six variables taken up in the present study.

7.6. DISCUSSION OF ^{THE} RESULTS (MATHEMATICS GROUP)

Tables 7.4, 7.5 and 7.6 represent the different steps in working out of the Multiple Regression Equation for predicting the scores of Mathematical Creativity form the

scores on Things Done On Your Own Checklist, Academic Achievement, Study Habits, Locus of Control, Intelligence and Interpersonal Relations respectively. The value of the Multiple Correlation (Multiple R) and F-ratio based on the Analysis of Variance between the Mean Squares due to 'Regression' and the 'Residual' effects have been given in Table 7.4 and are significant. Table 7.5 contains the variance Matrix of Regression Coefficients. While the Correlation Coefficients have been given above the diagonal, the values below the diagonal, represent the covariance values. This matrix was further utilized to derive the XTX Matrix from which the values of the Beta Coefficients were computed. The values of the Regression Weights, The Standard Error of Regression Weights, The Confidence intervals for the Regression Weights, Beta Coefficients, Standard Errors of the Beta Coefficients Correlations, Partial Correlations, Tolerance Limits for the Partial Correlations, have all been represented in Table 7.6.

From the Table 7.6 it is possible to derive the Regression Equation involving the score on the six variables in the raw score form as well as in the standard score form. The two equations are given as under :

Raw Scores Form

$$\bar{Y} = .18600X_1 + .10948X_2 + 3.82951X_3 - .39818X_4 + 9.03927X_5 - .09452X_6 + 93.57597$$

Where,

\bar{Y} = Score of an adolescent on Mathematical Creativity predicted from the variables taken for regression analysis,

X_1 = Score of the individual on Things Done On Your Own Checklist,

X_2 = Score of the individual on Intelligence.

X_3 = Score of the individual on Interpersonal Relations,

X_4 = Score of the individual on Locus of Control,

X_5 = Score of the individual on Study Strategy

X_6 = Score of the individual on Achievement

93.57597 = Value of the constant.

The extent to which predictions based on the regression equation are likely to be reliable is given by the value of Multiple R which is .2373. The value is significant and is indicative of moderately low reliability.

Standard Score Form

The Regression Equation in the standard score form is given by the expression :

\bar{Y}

$$\begin{aligned} \text{Mathematical} &= .13595\bar{X}_1 + .12088\bar{X}_2 + .01791\bar{X}_3 - .08968\bar{X}_4 \\ \text{Creativity} &+ .01074\bar{X}_5 - .10669\bar{X}_6 \end{aligned}$$

Where symbols have their previous meanings. The bars on the letters, \bar{X}_1 , \bar{X}_2 , \bar{X}_3 , \bar{X}_4 , \bar{X}_5 , \bar{X}_6 , indicate scores in standard score form.

It can be noticed that in the Regression Equation, while four of the six variables namely, Things Done On Your Own Checklist, Intelligence, Interpersonal Relations and Study Strategy are contributing positively to the predicted score, the variables namely, Locus of Control and Academic Achievement contribute negatively to the same. The present results clearly show that, the derived regression equation in the standard score form accounts for 94% of the mathematical creativity level (leaving almost 6% as residual).

7.7. ^{THE}DISCUSSION OF RESULTS (COMMERCE GROUP)

Tables 7.7, 7.8 and 7.9 represent the different steps in working out of the Multiple Regression Equation

for predicting the scores of Entrepreneurial Creativity from the scores on Things Done On Your Own Checklist, Academic Achievement, Study Habits, Locus of Control, Intelligence, and Inter-personal Relations respectively. The value of the Multiple Correlations (Multiple R) and F-ratio based on the Analysis of Variance between the Mean Squares due to 'Regression' and the Residual effects have been given in Table 7.7 and are significant. Table 7.8 contains the variance covariance Matrix of Regression Coefficients. While the Correlation Coefficients have been given above

the diagonal, the values below the diagonal represent the covariance values. This matrix was further utilized to derive the XTX Matrix from which the values of the Beta Coefficients were computed. The values of the Regression Weights, The Standard Error of Regression Weights, The Confidence intervals for the Regression Weights, Beta Coefficients, Standard Errors of the Beta Coefficients Correlations, Partial Correlations Tolerance Limits for the Partial Correlations have all been given in Table 7.9.

From the Table 7.9, it is possible to derive the Regression Equation involving the scores on the six variables in the raw score form as well as in the standard score form. The two equations are given as under ;

Raw Score Form

\bar{Y}

$$\begin{aligned} \text{Entrepreneurial Creativity} = & .41578X_1 - .03614X_2 + .04526X_3 + .01549X_4 \\ & - .08488X_5 - .13303X_6 + 82.07562 \end{aligned}$$

Where,

\bar{Y} = Score of an adolescent on Entrepreneurial Creativity predicted from the variables taken for regression analysis,

X_1 = Score of the individual on Things Done On Your Own Checklist,

X_2 = Score of the individual on Locus of Control,

X_3 = Score of the individual on Academic Achievement,

X_4 = Score of the individual on Interpersonal Relations (Overall),

X_5 = Score of the individual on Intelligence,

X_6 = Score of the individual on Study Strategy,

82.07562 = Value of the Constant.

The extent to which predictions based on the regression equation are likely to be reliable is given by the value of Multiple R which is .3033. The value is significant and is indicative of moderate reliability

Standard Score Form

The Regression Equation in the standard score form is given by the expression,

\bar{Y}

$$\begin{aligned} \text{Entrepreneurial Creativity} &= .20484\bar{X}_1 - 6.465E-03\bar{X}_2 + .02585\bar{X}_3 + .06939\bar{X}_4 \\ &\quad - .08023\bar{X}_5 - .19123\bar{X}_6 \end{aligned}$$

where, symbols have their previous meanings. The bars on the letters, \bar{X}_1 , \bar{X}_2 , \bar{X}_3 , \bar{X}_4 , \bar{X}_5 , \bar{X}_6 , indicate scores in the standard score form.

It can be noticed that, in the Regression Equation while three of the six variables namely, Things Done On Your Own Checklist, Achievement and Total Interpersonal Relations are contributing positively to the predicted score, the variables viz; Locus of Control and Study Strategy contribute negatively to the same. The present results clearly show that the derived regression equation in the standard score form accounts for 90% of the entrepreneurial creativity level, (leaving almost 10% as residual).

7.8 DISCUSSION OF ^{THE} RESULTS (GENERAL GROUP)

Tables 7.10, 7.11 and 7.12 represent the different steps in working out of the Multiple Regression Equation for predicting the scores on Your Own Checklist, Academic Achievement, Study Habits, Locus of Control, Intelligence and Interpersonal Relations respectively. The value of the Multiple Correlation (Multiple R), and F-ratio based on the Analysis of Variance between the Mean Squares due to 'Regression' and the 'Residual' effects have been given in Table 7.10 and are significant. Table 7.11 contains the Variance Covariance Matrix of Regression Coefficients, While the Correlation Coefficients have been given above the diagonal, the values below the diagonal represent the covariance values. This matrix was further utilized to derive the XTX Matrix from which the values of the Beta Coefficients were computed. The values of the Regression Weights, The Standard Error of Regression

Weights, The Confidence intervals for the Regression Weights, Beta Coefficients, Standard Errors of the Beta Coefficients Correlations, Partial Correlations, Tolerance limits for the Partial Correlations have all been represented in Table 7.12.

From Table 7.12 it is possible to derive the Regression Equation involving the scores on the six variables in the raw score form as well as in the standard score form. The two equations are given as under :

Raw Score Form

\bar{Y}

$$\begin{aligned} \text{General Creativity} &= .22319X_1 + .06287X_2 - .08938X_3 + 1.29669X_4 \\ &- 20295X_5 + .02004X_6 + 75.76166 \end{aligned}$$

Where,

\bar{Y} = Score of an adolescent on General Creativity predicted from the variables taken for regression analysis,

X_1 = Score of the individual on Things Done On Your Own Checklist,

X_2 = Score of the individual on Academic Achievement

X_3 = Score of the individual on Study Habits (Overall),

X_4 = Score of the individual on Locus of Control,

X_5 = Score of the individual on Intelligence,

X_6 = Score of the individual on Interpersonal Relations (Overall)

75.76166 = Value of the Constant.

The extent to which predictions based on the regression equation are likely to be reliable is given by the value of Multiple R which is .2569. The value is significant and is indicative of moderate reliability.

Standard Score Form

The Regression Equation in the standard score form is given by the expression :

\bar{Y}

$$\begin{aligned} \text{General Creativity} &= .08834\bar{X}_1 + 0.3323\bar{X}_2 - .12997\bar{X}_3 + .15500\bar{X}_4 - .13855\bar{X}_5 \\ &+ .06147\bar{X}_6 \end{aligned}$$

Where, symbols have their previous meanings. The bars on the letters X_1 , X_2 , X_3 , X_4 , X_5 and X_6 indicate scores in standard score form.

It can be noticed that in the Regression Equation, while four of the six variables namely, Things Done On Your Own Checklist, Academic Achievement, Locus of Control and Interpersonal Relations are contributing positively to the predicted score, the variables namely Study Habits and Intelligence contribute negatively to the same. The present results clearly show that the derived regression equation in the standard score form accounts for 93% of the general creativity level (leaving almost 7% as residual).

7.9. CONCLUSIONS In the light of the above discussion the following conclusions can be drawn :

1) It is possible to predict with moderately low accuracy, the scores on Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity of adolescents at the +2 level on the basis of their scores on,

- a) Things Done On Your Own Checklist
- b) Academic Achievement
- c) Overall Study Habits
- d) Locus of Control
- e) Intelligence and
- f) Overall Interpersonal Relations.

2) The results indicate that different variables contribute in their own unique manner to the regression equation. While the variables Things Done On Your Own Checklist contributes negatively in the case of predicting Scientific Creativity ; Intelligence,

Academic Achievement, Study Strategy, Interpersonal Relations and Locus of Control contribute positively to the predicted score. The variables namely Locus of Control and Academic Achievement contribute negatively in the case of predicting Mathematical Creativity, while Things Done On Your Own Checklist, Intelligence, Interpersonal Relations and Study Strategy contribute positively in the case of the predicted score. While Locus of Control and Study Strategy contribute negatively in the case of predicting Entrepreneurial Creativity; Things Done On Your Own Checklist, Achievement, and Total Interpersonal Relations contribute positively to the predicted score. The variables namely, Study Habits and Intelligence contribute negatively in the case of predicting General Creativity; The variables Things Done On Your Own Checklist, Academic Achievement, Locus of Control and Interpersonal Relations contribute positively to the predicted score.

3) The successful employment of scores on the selected variables in delineating regression equations to predict Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity respectively corroborates the hypothesis of the investigators that the variables taken up for the study do have some important associations with creativity in the above four fields at the +2 stage.

CHAPTER EIGHT

8.1 MAIN CONCLUSIONS AND SUGGESTIONS

8.1.1 ITEM ANALYSIS The following conclusions emerge after item analysis of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity:

- 1) All the five subtests included in the Battery of Tests of Scientific Creativity ('Zero Friction Conditions Test', 'Apparatus Selection Test', and 'Medicine Plant Test'); Three subtests in the Mathematical Battery, ('Dividing Circle Test', 'Square Completion Test' and 'Equations Test') and four subtests in the Battery of Tests of Entrepreneurial Creativity ('Identifying Characteristics Test', 'Problems Identification Test', 'Inspection Test' and 'Method Adoption Test') have been found to be capable of eliciting adequate responses, from the boys and girls at the +2 stage of education for whom the tests were developed.
- 2) Since all the subtests in the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity have shown capacities to elicit adequate, scorable and valid responses, it can be inferred that the language and the format of the test items, as also the time limits fixed for giving responses and the instructions are adequate.
- 3) The item analysis results have also brought to light, the suitability, adequacy and effectiveness of the scoring schemes developed to score the responses to the different subtests contained in the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity.
- 4) There has been found to exist a genuine differentiation between the 'upper' and the 'lower' groups, on the various creativity dimensions called into play while responding to the Tests of Scientific, Mathematical and Entrepreneurial Creativity. This is shown by the magnitude of the obtained 't' values, which in all

cases, are significant beyond .01 level of confidence.

5) Adolescents with high and low creativity can be genuinely differentiated on the basis of their total scores on each subtest included in the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity. This fact is borne out by the obtained 't' values which are all significant beyond .01 level of confidence.

6) There exist striking differences between the upper and lower groups on the basis of their total scores on scientific, mathematical and entrepreneurial creativity. This again is borne out by the obtained values of 't' all of which are significant beyond .01 level of confidence.

7) On the basis of item analysis, it can thus be said that the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity are capable of eliciting adequate responses, from the adolescents studying at the +2 level of education, in the fields of science, mathematics and commerce.

8.2. RELIABILITY AND VALIDITY STUDIES

8.2.1 RELIABILITY:

The following conclusions can be drawn regarding the reliability of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity:

1) The test-retest reliability coefficients are highly satisfactory and show that the batteries of the newly developed tests are stable and trust worthy.

2) The results also establish high inter-scorer reliability coefficients in case of the Batteries of Test of Scientific Mathematical and Entrepreneurial Creativity. In other words, if these tests are scores by different individuals trained for the purpose, errors due to the subjectivity of the scorers would not play a significant part.

- 3) The present results further indicate, that the scoring schemes developed for the different subtests in the three test batteries are objective in that the same individual can score the same set of answer sheets reliably on a second occasion, without errors. This also shows that the scoring procedures, and the directions to the scorers, are adequate and objective.
- 4) Since the Batteries of Tests of Scientific, Mathematical, and Entrepreneurial Creativity have shown very satisfactory levels of test-retest reliability, intra-scorer reliability and inter-scorer reliability, it can be concluded, that all the three test batteries are reliable tools for measuring creativity of the adolescents at the +2 level, in the fields of science, mathematics and commerce.

The following conclusions can be drawn regarding the reliability of the Study Habits Questionnaire (SHQ) and the Interpersonal Relations Inventory (IRI) :

- 1) The test retest reliability coefficients are highly satisfactory and show that the newly developed tests are stable and trustworthy.
- 2) The results also establish high inter-scorer reliability coefficients in case of the SHQ and IRI. In other words, if these tests are scored by different individuals trained for the purpose errors due to subjectivity of the scores, would not play a significant part.
- 3) The present results indicate that the scoring schemes developed for the SHQ and IRI are quite objective in that the same individual can score the same set of answer sheets reliably on a second occasion, without errors. This also shows that the scoring procedures are adequate.

4) Since the SHQ and the IRI have shown very satisfactory levels of test-retest, intra-scorer and inter-scorer reliability and inter-scorer reliability, it can be concluded that both the newly developed tests are reliable tools for measuring Interpersonal Relations (CPIR, TPIR, SIR and FIR) and Study Habits of adolescents at the +2 level, in the fields of science, mathematical and commerce, and general fields.

8.2.2. VALIDITY

The validity studies revealed as under :

- 1) On the basis of the creative abilities called into play while responding to the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity; there seems to be satisfactory indication that the tests in the three creativity batteries possess adequate content validity.
- 2) The Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity possess both construct and concurrent validity as evidenced from the nature and magnitude of the validity coefficients computed.
- 3) The validity coefficients between the Study Habits Questionnaire (SHQ) on one hand and Things Done On Your Own Checklist, Achievement and Intelligence on the other are positive moderately high and significant. The obtained values are indicative of satisfactory construct validity.
- 4) The same can be said of the validity coefficients between the Interpersonal Relations Inventory and the different criteria taken for establishing validity. The correlations are low but positive and significant. The obtained values can be taken as a satisfactory index of construct validity of the IRI.

5) Both the newly developed tests viz; The Study Habits Questionnaire and the Interpersonal Relations Inventory have reported a low but positive and moderate significance with the creativity test scores which accounts for a satisfactory concurrent validity.

It can thus be concluded that the SHQ and the IRI possess both as is evidenced from the nature and magnitude of the validity coefficients computed. 7
a
concurrent
valid

8.3. NATURE OF DATA

A) SCIENTIFIC CREATIVITY

1) The scores on all the dimensions of Scientific Creativity viz; Fluency, Flexibility, Originality, Inventiveness, Productive Designing Ability and Scientific Creativity are by and large normally distributed. It can be concluded therefore, that scientific creativity as measured by the newly developed Battery of Tests of Scientific Creativity is an ability which is normally distributed in the population at the +2 level of education.

2) Notwithstanding the slight positive skewness and the leptokurtic nature of the frequency distributions based on the scores on the various dimensions of scientific creativity it can be concluded that, if the data is collected on a larger population, there is every possibility of getting a normal probability curve, for the scores on the different dimensions namely Fluency, Flexibility, Originality, Inventiveness, Productive Designing Ability and Scientific Creativity for which scores can be obtained from the Tests of Scientific Creativity.

B) MATHEMATICAL CREATIVITY

1) The scores on all the dimensions of Mathematical Creativity viz; Fluency, Flexibility, Originality, Transformation and

Mathematical Creativity are distributed normally, in the general population and mathematical creativity as measured by the Battery of Tests of Mathematical Creativity is an ability which is normally distributed among the population at the +2 level of education.

2) Scores on the different creative abilities comprising Mathematical Creativity viz; Fluency, Flexibility, Originality, Transformation and Mathematical Creativity are also normally distributed among the population.

C) ENTREPRENEURAL CREATIVITY

1) Entrepreneurial Creativity as measured by the Battery of Tests of Entrepreneurial Creativity, is a normally distributed ability, among the adolescents studying at the +2 level of education. The score on creativity dimensions namely Fluency, Flexibility, Originality and Entrepreneurial Creativity are also by and large normally distributed in the population.

2) Notwithstanding the slight deviations from normality, it can be concluded that if data on the different dimension of entrepreneurial creativity is collected on a larger sample, there is every possibility that the resulting graphical distributions will largely resemble the normal probability curve.

D) GENERAL CREATIVITY

1) Verbal Creativity as measured by the MIER Tests of Verbal Creativity is a normally distributed ability.

2) Non-Verbal Creativity as measured by the Verbal and Non-Verbal Batteries of MIER Tests of Creativity happens to be a normally distributed ability. If data on a larger sample is collected, there is large likelihood of getting a frequency distribution closely resembling a normal probability curve.

8.4. COMPARISON OF SETS OF IDENTIFICATIONS YIELDED BY NEWLY DEVELOPED BATTERIES WITH IDENTIFICATION MADE THROUGH TESTS OF GENERAL CREATIVITY

The tests of creativity specially constructed to identify creative adolescents in the field of mathematics, science, and commerce yield sets of identifications which are significantly different from the identifications yielded by the tests of general creativity. The obtained results show that, the Tests of General Creativity are likely to miss nearly seventy five percent of the adolescents at the +2 stage who would otherwise be identified as having high creativity in the fields of science, mathematics and commerce, by using special tests developed for the purpose. Not only this, the identifications of the adolescents as highly creative or low creative would be identical in only about twenty five percent cases. Taken as a whole, this lead s one to conclude that much trust or confidence cannot be placed on the Tests of General Creativity in the matters of identifying talented adolescents in diverse fields at the +2 level of education. This highlights the justification of developing new tests of creativity with a view to identifying adolescents with high Scientific Creativity, Mathematical Creativity, and Entrepreneurial Creativity and thereby, departing from the convention of basing our judgement on the Tests of General Creativity.

8.5 COMPARATIVE PROFILES OF ADOLESCENTS WITH HIGH ENTRE- PRENEURAL, SCIENTIFIC, MATHEMATICAL AND GENERAL CREATI- VITY ON SOME SELECTED VARIABLES

The following conclusions emerge after the analysis of the results and discussion on the profiles of adolescents creative in the fields of Commerce, Science and Mathematics and General Field :

1) The adolescents with high Entrepreneurial Creativity, Scientific Creativity and General Creativity respectively have been found to possess significantly superior, 'healthy', 'positive' and 'warm' interpersonal relations with their parents, teachers, siblings and friends, than the adolescents with low Entrepreneurial, Scientific

and Mathematical Creativity. This shows that the higher the creativity level in the above field, better the interpersonal relations.

The scores on Inter Personal Relations of the adolescents with high and low Mathematical Creativity could not, however, be found to differentiate between them. It indicates that the interpersonal relations of mathematically gifted adolescents may not be very good. However, symptomatic results in the case of their Total Interpersonal Relations indicate that the adolescents with high Mathematical Creativity are likely to have somewhat better and more positive interpersonal relations than their counterparts.

2) The adolescents with high Entrepreneurial Creativity, Scientific Creativity, Mathematical Creativity and General Creativity respectively have been found to excel their counterparts with low creativity on Intelligence. This indicates that the adolescents endowed with high creativity in the fields of science, commerce and mathematics and the general field also possess a high level of intelligence.

3) The adolescents with high and low Scientific, Mathematical, Entrepreneurial and General Creativity could not be differentiated on the basis of their scores on Locus of Control.

4) The adolescents with high Entrepreneurial and Scientific Creativity have been found to be significantly more capable of initiating 'novel', 'interesting' and 'creative' activities and completing them on their own as compared to the adolescents with low Entrepreneurial and Scientific Creativity.

The scores on Self-Initiated Activities could not however differentiate between the adolescents with high Mathematical and high General Creativity.

- 5) The adolescents with high Scientific, Mathematical, Entrepreneurial and General Creativity have been found to excel the adolescents with low Scientific, Mathematical, Entrepreneurial and General Creativity on achievement. Thus, the likelihood of finding highly creative adolescents in the streams of science, mathematics and commerce, and the general field from the high achieving group is very bright.
- 6) The adolescents with high Entrepreneurial creativity and high Mathematical Creativity have been found to be significantly superior to their counterparts with low Entrepreneurial and Mathematical Creativity with regard to General Creativity. This shows that the creative adolescents in the fields of Commerce and Mathematics are equally creative in general field not directly related to their own specific stream of study.

However, in the case of the scientifically creative adolescents, the only area wherein they were found to excel their counterparts with low creativity was with respect to Non-Verbal Creativity. Thus, adolescents with high scientific creativity have been found to be endowed with high non-verbal creativity.

- 7) The Overall Study Habits with respect to Habits with Regard to Time and Duration; Mode of Study; Classroom Study; Planning the Study; Preparation for Examinations; Extra Reading and Memorization of the adolescents with high Scientific Creativity, Entrepreneurial Creativity and General Creativity have been found to be significantly superior to those of the adolescents with low Scientific Creativity, Entrepreneurial Creativity and General Creativity.

With the exceptions of Habits with Regard to Planning the Study and Memorization all the other dimensions of Study Strategies enumerated above were found to establish the superiority of the adolescents with high Mathematical Creativity over the adolescents with low Mathematical Creativity.

It can, thus, be concluded from the obtained results that the adolescents with high Entrepreneurial Creativity have been found to be significantly superior to the adolescents with low Entrepreneurial Creativity on all the selected key variables in the present study (Child-Parent Interpersonal Relations, Teacher-Pupil Interpersonal Relations, Siblings Interpersonal Relations, Friends Interpersonal Relations and Total Interpersonal Relations), Intelligence, Self Initiated Activities, Verbal Creativity, Non-Verbal Creativity, General Creativity, Achievement, Habits with Regard To Time and Duration; Habits With Regard To Mode of Study; Planning the Study; Preparation for Examinations; Classroom Study; Extra Reading. Memorization and Total Study Strategies respectively. The two groups of adolescents however, could not be differentiated on the basis of their scores on Locus of Control.

In the case of Scientific Creativity, it has been found that excepting on Locus of Control, Verbal Creativity, General Creativity and Habits With Regard to Memorization, on all the other selected variables enumerated above, the superiority of the adolescents with high Scientific Creativity over the adolescents with low Scientific Creativity is statistically established.

With the exceptions of the variables namely Total Interpersonal Relations (CPIR, TPIR, SIR, FIR); Locus of Control, Self Initiated Activities and Habits Regarding Planning and Memorization, on which the adolescents with high and low Mathematical Creativity could not be significantly differentiated, in all the other areas taken up for comparison, the adolescents with high Mathematical Creativity were found to excel the adolescents with low Mathematical Creativity.

The adolescents with high General Creativity have been found to be significantly superior to the adolescents with low General Creativity on almost all the selected key variables.

The only scores which could not differentiate between the two groups were concerned with variables Locus of Control and Self Initiated Activities (Things Done On Your Own Checklist).

Thus, the present investigation has resulted in yielding conclusive evidence whereunder, clear cut demarcation between adolescents endowed with high and low Scientific, Mathematical, Entrepreneurial and General Creativity has become possible on the basis of the selected psycho-social, and educational variables. At the same time, the present results have enabled the investigators to delineate profiles of adolescents with high and low Scientific, Mathematical, Entrepreneurial and General Creativity on the selected psycho-social and educational variables in terms of the inter group differences. The investigators are not familiar with any published work on adolescents at the +2 level wherein, inter-group differences between the four groups of adolescents with high creativity have been compared so exhaustively, both in statistical as well as qualitative terms. As a result of this, our knowledge regarding the characteristics of adolescents, endowed with different kinds of talents has been substantially increased, both when compared to the adolescents with high and low creativity and adolescents with different kinds of creativity.

A unique feature of the present results happens to be the fact that, besides the profiles of the adolescents, important information has been secured on the common characteristics of the different groups of adolescents at the +2 stage, in terms of perceived self-images and vocational preferences. The results show that, the Indian adolescents, endowed with high and low creativity in various fields, by and large, are full of adventure and 'optimism', are 'bold', 'confident', 'active', 'dynamic', 'clear thinking', 'self-controlled', 'intelligent' etc. and their vocational aspirations are quite high (Engineer, Scientist, Doctor, IPS, Judge, Lawyer, Botanist, Fighter Pilot (Adolescents with high and low Scientific Creativity); Chartered Accountant,

Judge, Economist, Engineer, Lawyer, Pilot (Adolescents with high and low Entrepreneurial Creativity); Industrial Engineer, IAS Officer, IFS Officer, Scientist, Lawyer, Fighter Pilot, Air Force Officer, Doctor, Computer Programmer (Adolescents with high and low Mathematical Creativity); Engineer, Computer Programmer, Fighter Pilot, Doctor, IAS Officer, Film Director, Lawyer, Engineer, Chartered Accountant, Computer Technician (Adolescents with high and low General Creativity) and this happens to be a common feature of adolescents studying in Jammu City irrespective of the fact whether they are highly creative or not.

On the basis of the obtained results, it should become possible for the teachers, researchers and administrators to understand the career aspirations, dynamics of behaviour and personality structures of adolescents as a group.

The obtained results also amply justify the need for developing different tests of creativity to identify creative adolescents in different areas rather than in ^{the} general field. The hypothesis of the investigators that the general tests of creativity may not be able to differentiate between adolescents gifted with different talents especially in the mathematical, entrepreneurial, scientific and general fields, has been established beyond any doubt, as, clearly differentiated profiles of adolescents have been delineated as had been envisaged. Thus, the soundness of the basis rationale behind conducting the present investigation has been firmly proved.

The present results clearly indicate the need to develop special strategies for encouraging different kinds of creative talents among adolescents at the +2 stage of education and the need to develop different screening devices to identify adolescents gifted in different fields, besides the ones taken up in the present study, and tackling them in ways unique to each group.

The results of the present investigation corroborate the results reported by several other investigators regarding

(i) The positive relationship between creativity and intelligence (Phatak 1961, 62; Raina 1968; Trivedi 1969; Passi 1971; Sharma 1971; Sharma 1972; 1974; Azmi 1974; Bedi 1974; Goyal 1974; Joshi 1974; Kumari 1975; Dhaliwal and Saini 1976; Dutt et. al., 1977; Gakhar and Kaura 1977; Singh, Mathur and Saxena, 1977. Singh 1978; Patel and Joshi 1978; Badrinath and Satyanarayan 1979; Gulati 1979, Gupta 1979; Jarial 1979; Sandhu 1979; Jarial and Sharma 1980; Gakhar et.al; 1980; Chadha and Sen 1981); (II) The positive and significant relationship between scholastic achievement and creativity (Raina 1968; Trivedi 1979; Khire 1971; Lalithamma 1973; Bagga 1973; Bedi 1974; Jain 1975; Pandit 1976; Mehdi 1977; Singh, Mathur and Saxena 1977; Singh 1978; Awasthy 1979; D'Lina 1979; Gupta 1979; Masih 1979; Sandhu 1979; Asha 1980; Vijayalakshmi 1980; and Jarial 1981); (iii) Traits of creative personality and/or perceived self images of highly creative and low creative adolescents (Singh 1971; Hundal 1969; Dallas and Gaire 1970; Roe, Taylor, Knapp, Cattell, Macurdy, McClelland, Eiduson, Chambers and Gough reported by Barron 1968; Mackinnon 1962; Dudek 1962, 1970a ; Khatena 1976; Khatena and Raina 1977; Raina 1968; Lalithamma 1973; Verma 1973; Goyal 1974; Joshi 1974; Kumar 1978; Singh 1980; Bhan 1973; Gakhar 1975; Nair 1976; Gupta 1977; Mallapa and Upadhyaya 1977; Jha 1975; Gopal 1975; Bharadwaj and Gupta 1981; Mc Alpine 1972; Aaron and Malatesha). (iv) Vocational preferences of adolescents (Krishnan 1956; Grunes 1956; Rosenberg 1957; Sharma 1958; Pandey 1963; Hilton et.al., 1970; Sinha and Dash 1959; Cook 1962; Singh and Prasad, Razler 1963 and Bhan 1973), and contradict the results of (Paramesh and Narayan 1974; Bhan 1973; Singh and Mehra 1981) who reported that the vocational interests of the highly creative people are vastly different from those of their counterparts with low creativity; (Verma 1980), who reported that the highly creative were internal on Locus of Control.

However, some of the results of the present investigation do provide evidence of contradicting nature regarding the profiles of adolescents with high creativity.

Generally, highly creative individuals are held to be 'absent-minded', 'sloppy', 'indifferent' and 'idiosyncratic'. The present results on the Interpersonal Relations (Child-Parent, Teacher-Pupil, Siblings and Friends Interpersonal Relations) of the adolescents endowed with high Entrepreneurial, Scientific and General Creativity, interestingly show that these adolescents have 'warm', 'positive' and 'healthy' interpersonal relations. In the case of the adolescents with high mathematical creativity however, it was found that their interpersonal relations are somewhat inferior to those of their counterparts with high scientific, entrepreneurial and general creativity.

The variable of Locus of Control was found to be incapable of differentiating between adolescents with high and low Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity thereby indicating that Locus of Control may not be a differentiating variable between the adolescents with high and low creativity at the +2 stage. On the other hand, Locus of Control may prove to be a significant factor during later or mature years.

Creative people are normally held to be 'disorganized', and known to tackle their work in 'spurts' and 'jerks'. However, the results of the adolescents highly creative in the fields with regards to their Overall Study Habits, provide convincing evidence to the effect that the creative adolescents (prospective Scientists, Entrepreneurs) adolescents with high General Creativity and the creative mathematicians) are fully capable of chalking out 'organized', 'systematic', and detailed strategies for dealing effectively with their academic work load even though, the adolescents with high mathematical creativity have somewhat inferior study habits as compared to their counterparts with high creativity in other spheres.

An interesting feature of the results obtained in the present investigation happens to be the fact that factor of Intelligence has proved to be a differentiating factor at different levels and types of creative talent. On the basis of the present results, the adolescents with high Mathematical Creativity were found to excel the other three creative groups on Intelligence (followed by the adolescents with high Scientific Creativity, adolescents with high General Creativity and adolescents with high Entrepreneurial Creativity).

Analysis of the data indicates that we can extend the threshold hypothesis first put forward by Getzels and Jackson (1951) whereby, intelligence creativity relationship and differentiation can be understood. It appears that at different intelligence levels above the minimum threshold level of intelligence required for emergence of creativity, different creativity can be identified first, at higher levels scientific creativity can be distinguished. Mathematical Creativity however seems to blossom at higher levels of intelligence. No wonder, the mathematically creative adolescents do not have very superior study strategies and interpersonal relations, since they seem to derive their basic inspiration and satisfaction from the insights and flashes rather than sheer hard work and memorization and they are also somewhat erratic or poor in their interpersonal relations.

The above result brings to light the need to identify, nurture and monitor the creative talents of the individuals endowed with mathematical talent and organise remedial and guidance programmes right from their early childhood. We are, to some extent, familiar with creative thinking and behaviour of creative artists/musicians/scientists etc. but not much is known about creative mathematicians who have, by and large, remained neglected. However the recent attempts at organizing 'Mathematical Olympiads', 'National Talent Searches' etc. are praiseworthy though tentative attempts in this direction.

The results of the present investigation do provide a convincing answers to the basis questions posed in the present study namely (a) "What distinguishes a creative adolescent talented in one field from another adolescent talented in another field?" (b) In what ways are adolescents endowed with creativity in the field of science, mathematics, commerce and general fields similar and different from each other?". (c) "How do adolescents with high and low creativity in the fields of science, commerce and general fields differ from each other when compared vis-a-vis some selected psycho-socio-educational factors?".

As the result of the data presented in the Chapter, inter-group profiles of adolescents gifted with scientific creativity, mathematical creativity, entrepreneurial creativity and general creativity have emerged which can, in all humility, be claimed to be a significant contribution to our limited knowledge on the subject.

Last, but not the least, the results obtained in the present investigation, do provide a convincing evidence of the validity of the newly developed batteries of (i) Tests of Scientific Creativity (ii) Tests of Entrepreneurial Creativity and (iii) Tests of Mathematical Creativity. It is hoped that the helpful to prospective researchers to launch several investigations in future years to identify and study the adolescents with different talents at the +2 stage of education.

8.6 INTER GROUP DIFFERENCES IN PROFILES OF ADOLESCENTS WITH HIGH SCIENTIFIC, MATHEMATICAL, ENTREPRENEURIAL AND GENERAL CREATIVITY

The study of inter group differences revealed as under :

- 1) The "Overall Interpersonal Relations" (Child-Parent Interpersonal Relations, Teacher-Pupil Interpersonal Relations, Siblings Interpersonal Relations and Friends Interpersonal Relations) of the adolescents with high Scientific Creativity

are the most superior, followed by adolescents with high Entrepreneurial Creativity and adolescents with high General Creativity. Among the four groups of adolescents creative in the streams of Science, Commerce, Mathematics and General field, the adolescents with high Mathematical Creativity have been found to possess the poorest interpersonal relations.

2) In the field of "Academic Achievement", the adolescents with high Mathematical Creativity have been found to be the highest achievers, followed by the adolescents with high Scientific Creativity and the adolescents with high Entrepreneurial Creativity have emerged as the poorest achievers among the four creative groups of adolescents.

3) The present study conclusively reveals that the level of "Intelligence" of the adolescents endowed with high Mathematical Creativity is the highest among the four groups of creative adolescents, followed by adolescents with high Scientific Creativity and high General Creativity. The group with high Entrepreneurial Creativity has been found to possess the lowest level of Intelligence when compared with their counterparts with high Mathematical, Scientific and General Creativity.

4) Out of the four groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity, the adolescents with high Entrepreneurial Creativity have been found to possess maximum capacity for initiating novel, interesting and creative activities and completing them on their own. This group is followed by the groups of adolescents with high Mathematical Creativity and adolescents with high General Creativity. The adolescents with high Scientific Creativity have been found to possess least capacity for initiating and completing novel, interesting and creative activities.

5) Among the four groups of adolescents endowed with high creativity in the fields of Science, Mathematics, Commerce and General fields, the adolescents with high Entrepreneurial

Creativity have been found to possess the best "Study Habits" or "Study Strategies", followed by the adolescents with high General Creativity and adolescents with Scientific Creativity. The adolescents with high Mathematical Creativity have been found to possess the lowest mean score on Study Strategies in comparison to the other groups of creative adolescents.

6) Among the four groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity, the adolescents with high Mathematical Creativity are most significantly 'External' on 'Locus of Control'. They are followed by the adolescents with high General Creativity and the adolescents with high Entrepreneurial Creativity. Adolescents with high Scientific Creativity have been found to possess relatively internal Locus of Control.

In conclusion, it can be said that out of the four groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity, the adolescents with high Scientific Creativity have the best Interpersonal Relations, are relatively internal on Locus of Control; the adolescents with high Mathematical Creativity are the highest achievers academically and possess the highest level of Intelligence and are most significantly external on Locus of Control. The adolescents with high Entrepreneurial Creativity have the best Study Habits and possess maximum capacity to initiate and complete novel and interesting activities.

7) The adolescents with high entrepreneurial creativity have been found to perceive themselves in terms of adjectives namely; 'Active', 'Confident', 'Clear Thinking', 'Practical', 'Sensitive', 'Systematic', 'Self-Controlled', 'Frank', 'Bold', 'Atheist' and 'Modest'. By and large they have perceived themselves in terms of 'positive', 'energetic', and 'dynamic' images which are indicative of 'balanced', 'well adjusted' personality structures.

8) The perceived self-images of the adolescents with high Scientific Creativity can be described in terms of the adjectives viz; 'Active', 'Brave', 'Cheerful', 'Confident', 'Clear Thinking', 'Graceful', 'Noble', 'Self-Controlled', 'Conservative' and 'Sensitive'.

The perceived self-images of these adolescents are mostly positive and convey robustness, dynamism and vitality. The group of highly creative adolescents in the stream of science is characterised by greater self-acceptance high sense of personal well-being, and societal adjustment and an appreciable degree of self-confidence.

9) The adolescents with high Mathematical Creativity have perceived themselves in terms of the images viz; 'Responsible', 'Noble', 'Punctual', 'Brave', 'Clear Thinking', 'Graceful', 'Self-Controlled', 'Strong', 'Sensitive', 'Practical', 'Serious' and 'Conservative'.

While the above self-images (as a whole) cannot exactly be characterised as being 'dynamic', 'energetic' and 'forceful'; they, can certainly be called 'positive', 'healthy' and 'realistic', indicative thereby, of optimistic attitude towards life, a good sense of self worth, and a balanced disposition.

10) The adolescents endowed with high General Creativity have been found to perceive themselves in terms of adjectives like 'Active', 'Confident', 'Disciplined', 'Clear Thinking', 'Cheerful', 'Fair-Minded', 'Happy', 'Responsible', 'Conservative' and 'Sensitive'.

While the above self-images are 'positive' and 'optimistic', they also indicate the presence of high self-acceptance strong self-sentiment and well adjusted personality structure.

11) The results show that, on the whole, considerable overlapping is present among the self-images of adolescents with high Scientific, Mathematical, Entrepreneurial and General Creativity.

While the groups of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity have perceived themselves as being, 'Clear Thinking' and 'Sensitive', other adjectives which are commonly found in the self-images of different groups are 'Active' and 'Confident' (Adolescents with high Entrepreneurial Creativity, Scientific Creativity and General Creativity), 'Practical' (Adolescents with high Entrepreneurial and Mathematical Creativity); 'Brave', 'Graceful' and 'Noble' (Adolescents with high Scientific and Mathematical Creativity); 'Self-Controlled' (Adolescents with high Entrepreneurial, Scientific and Mathematical Creativity); 'Cheerful' (Adolescents with high General and Scientific Creativity); 'Conservative' (Adolescents with high Scientific, Mathematical and General Creativity); and 'Responsible' (Adolescents with high Mathematical and General Creativity).

12) The adjectives which have been observed to be exclusive to the self-images of the group of adolescents with high Mathematical Creativity are; 'Punctual', 'Strong', and 'Serious'.

The adjectives which have been found to differentiate the self-images of adolescents with high General Creativity from the group of adolescents with high Scientific Creativity, group of adolescents with high Entrepreneurial Creativity and the adolescents with high Mathematical Creativity are; 'Disciplined', 'Fair Minded', and 'Happy'.

The adjectives which have been found to be exclusive to the self-images of the group of adolescents with high Entrepreneurial Creativity are; 'Systematic', 'Frank', 'Bold', 'Modest', and 'Atheist'.

No adjective in the perceived self-images of the adolescents with high Scientific Creativity was found to be exclusive to this particular group.

13) The adolescents with high Entrepreneurial Creativity have been found to show marked preferences for the vocations namely; 'Bank Cashier', 'Bank Officer', 'Chartered Accountant', 'Lecturer', 'Judge', 'Economist', 'Army Officer', 'Engineer', 'Poet' and 'Musician'.

It can be said that the vocational choices of these adolescents are realistic in nature and in accordance with their stream of study. At the same time, the group of adolescents with high Entrepreneurial Creativity have been found to exhibit qualities of 'courage', 'risk taking' and 'dynamism' in their vocational choices, qualities which are associated with the creative process and creative thinking.

14) The adolescents with high Mathematical Creativity have been found to prefer the vocations viz; 'Industrial Engineer', 'Air Force Officer', 'IAS Officer', 'IFS Officer', 'Scientist', 'Lawyer', 'Accountant', 'Lecturer', 'Fighter Pilot' and 'Bank Officer'.

The adolescents with high Mathematical Creativity have been found to be chiefly motivated by the status and prestige involved with different vocations. Their vocational choices reveal a lack of maturity and awareness on their part. This may account for their somewhat unrealistic and inconsistent preferences. However, it is quite possible that the fault lies not with our mathematically creative minority, but with the policy planners and educational administrators and is due to the utter lack of constructive educational and vocational guidance, programmes at the school level especially at the +2 level of education.

15) The adolescents with high Scientific Creativity have shown preference for the vocations namely; 'Scientific', 'Doctor', 'Engineer', 'IPS Officer', 'Fighter Pilot', 'Army Officer', 'Judge', 'Lecturer', 'IFS Officer', 'Air Force Officer' and 'Lawyer'.

The observed results show that, to a large extent, the vocational preferences of the adolescents with high Scientific Creativity are 'realistic', 'consistent' and 'attainable'.

However, some vocational choices seem to be chiefly motivated by their social status and may be made due to incomplete awareness and lack of maturity on the part of the scientifically creative adolescents.

16) The adolescents with high General Creativity have shown preference for the vocations viz; 'Engineer', 'Computer Programmer', 'Fighter Pilot', 'Doctor', 'IFS Officer', 'Film Director', 'Lecturer', 'Lawyer', 'Accountant' and 'Air Force Officer'.

The vocations chosen by the adolescents with high General Creativity are high in status and prestige. At the same time, these vocations have been found to possess a greater range and diversity, indicating the presence of a reasonably good awareness of the world of work on the part of the adolescents with high General Creativity.

17) a) The present results indicate that all the four groups of adolescents endowed with Scientific, Mathematical, Entrepreneurial and General Creativity have chosen the vocations viz; 'Lecturer' and 'Engineer'. It is indeed heartening to observe that the vocation of 'Teaching' (considered as traditional, passive vocation and low in status value by conventional standards) rates among the top ten vocational preferences of our highly creative adolescents in the streams of Science, Mathematics and Commerce and General fields.

b) The vocations which have been jointly checked out by the adolescents with high Entrepreneurial Creativity and adolescents with high Scientific Creativity are 'Judge' and 'Army Officer'.

Both groups seem to have been influenced by what can be described as 'the glamour of the uniform'.

c) The vocation of a 'Bank Officer' has been checked out jointly by the adolescents with high Entrepreneurial Creativity and adolescents with high Mathematical Creativity.

While this choice seems realistic in the case of the former group; in the latter case it indicates a tendency to underestimate the limits of creative potential and link it with clerical, managerial or numerical aptitude.

d) The adolescents with high Mathematical Creativity, the adolescents with high Scientific Creativity and the adolescents with high General Creativity have jointly checked out the vocations viz; 'Air Force Officer', 'Lawyer' and 'Fighter Pilot'.

It can be presumed from the above similarities in vocational preferences that these adolescents are of a 'dynamic' 'vital' and 'forceful' disposition (which is confirmed from their perceived self-images).

e) The adolescents with high Mathematical Creativity and the adolescents with high General Creativity have jointly shown preference for the vocations viz; 'IAS Officer' and 'Accountant'.

These choices though realistic in both cases, are quite different where their status value is concerned.

f) The vocations of 'IFS Officer' and 'Scientist' have been checked out by the adolescents with high Mathematical Creativity and high Scientific Creativity. These choices can be considered to be well within the productive and creative resources of the two groups (eventhough the first choice seems to be related to glamour or social prestige).

g) The adolescents with high Scientific Creativity and the adolescents with high General Creativity have exhibited a 'realistic' career aspiration in their joint choice of the vocation of a 'Doctor'.

h) The vocational choices which are exclusive to the group of adolescents with high Entrepreneurial Creativity are; 'Bank Cashier', 'Chartered Accountant', 'Economist', 'Poet' and Musician. The last two vocations do not seem to be linked with their stream of study but reflect the presence of talents which are characteristic of artistic creative ability.

i) The vocational choices which differentiate the adolescents with high General Creativity from their counterparts with high Creativity in the fields of Mathematics, Commerce and Science are; 'Computer Programmer' and 'Film Director'.

j) The sole vocational choice which has been observed to be exclusive to the group of adolescents with high Scientific Creativity is their choice of the vocation viz; 'IPS Officer'.

k) All the top ten vocational choices of the adolescents with high Mathematical Creativity overlap with one or other choices checked out by the adolescents in the remaining three groups.

This result brings to light two revealing facts :

i) Adolescents with high Mathematical Creativity have much in common with their counterparts endowed with high Scientific Creativity, Entrepreneurial Creativity and high General Creativity with reference to Vocational Preferences.

ii) The adolescents endowed with high Scientific Creativity, Entrepreneurial Creativity and high General Creativity have retained some measures of independence and uniqueness in their vocational preferences, which does not seem to be the case among the adolescents with high Mathematical Creativity.

A convincing evidence has been furnished in the present study about the consistency among the vocational choices and the perceived self-images of the adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity. This shows that the creative personality (irrespective of the field/area/stream/specifics) is 'holistic' and 'homogenous' in its basic structure.

8.7 PREDICTION OF CREATIVITY FROM SELECTED VARIABLES

1) It is possible to predict with moderately low accuracy, the scores on Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity of adolescents at the +2 level on the basis of their scores on,

- a) Things Done On Your Own Checklist
- b) Academic Achievement
- c) Overall Study Habits
- d) Locus of Control
- e) Intelligence and
- f) Overall Interpersonal Relations.

2) The results indicate that different variables contribute in their own unique manners to the regression equation. While the variables Things Done On Your Own Checklist contributes negatively in the case of predicting Scientific Creativity; Intelligence,

Academic Achievement, Study Strategy, Interpersonal Relations and Locus of Control contribute positively to the predicted score. The variables namely Locus of Control and Academic Achievement contribute negatively in the case of predicting Mathematical Creativity, while Things Done On Your Own Checklist, Intelligence, Interpersonal Relations and Study Strategy contribute positively in the case of the predicted score. While Locus of Control and Study Strategy contribute negatively in the case of predicting Entrepreneurial Creativity; Things Done On Your Own Checklist, Achievement, and Total Interpersonal Relations contribute positively to the predicted score. The variables namely, Study Habits and Intelligence contribute negatively in the case of predicting General Creativity; The variables Things Done On Your Own Checklist, Academic Achievement, Locus of Control and Interpersonal Relations contribute positively to the predicted score.

3) The successful employment of scores on the selected variables in delineating regression equations to predict Scientific Creativity, Mathematical Creativity, Entrepreneurial Creativity and General Creativity respectively corroborates the hypothesis of the investigators that the variables taken up for the study do have some important associations with creativity in the above four fields at the +2 stage.

SUGGESTIONS FOR FURTHER RESEARCH

The present study brings into focus, several topics towards which further research can be directed. A few of these topics are given below :

- 1) There is utter paucity of reliable and valid tools for identifying creativity at the school stage in areas other than of Scientific, Mathematical and Entrepreneurial Creativity. Tests of Musical Creativity, Artistic Creativity and Literary Creativity are some such areas. More research efforts need to be taken up for the development and standardization of such tools. Such tools could be both verbal and non-verbal; performance type or paper pencil type; individual tests or group tests.
- 2) It is suggested that more research studies should be taken up, to establish the reliability and validity of the Batteries of Tests of Scientific, Mathematical and Entrepreneurial Creativity developed for the present study, keeping in view other criteria like teachers ratings, peer ratings, aptitudes of the adolescents, value preferences of adolescents etc. In particular parallel forms of the present batteries of tests of Scientific Creativity, Mathematical Creativity and Entrepreneurial Creativity need to be developed and norms need to be established over different populations in different regions/states of the country. Also, it would be worthwhile to adapt these batteries in regional languages. Validity Studies involving working out of predictive validity and factorial validity need to be taken up.
- 3) It will be worthwhile from the point of view of research to conduct indepth analyses of the extent and level of Scientific, Mathematical, Entrepreneurial and General Creativity among adolescents and adults, taking into consideration predictor variables other than those utilized in the present investigation. Some of the variables which could be taken up are namely; Rural-Urban-Backward, Socio-economic Status, Personality traits like, sense

of humour, social maturity, emotional behaviour, aptitudes, special abilities, risk taking and other variables that could be expected to differentiate between the different groups of highly creative adolescents.

4) At a time and age when creative citizens are in the minority, it is very important, to undertake investigations in which people endowed with creative abilities in different fields can be identified and the most desirable/conducive environment for their optimum enhancement can be determined and created. It will also be worthwhile to correlate scores on new batteries of tests of creativity with scores obtained by recognized creative personalities in the fields of Mathematics, Science and Commerce.

5) It will surely be interesting from the research point of view to study the incidence of specific types (Scientific, Mathematical and Entrepreneurial) of creativity, among males and females separately and analyse in depth, the inter-group differences between them as also among adolescents right from the pre-adolescents to later adolescents stage studying in different types of institutional environments belonging to different backgrounds and being taught by teachers with different characteristics.

6) In the present study, no attempt could be made, in view of the large number of variables involved, to study the contributing influence (or otherwise) of home factors like creativity of the parents, degree of stimulation at home, parental control and support etc. It would be important and useful to undertake research investigations on this aspect, in order to fully understand the impact of home factors. The results of such studies would be of considerable help in guiding parents accordingly.

7) It is suggested that, more research studies be conducted, to establish the personality and behaviour profiles of the teachers of adolescents with high and low creativity levels, teaching styles, evaluation methodologies and classroom management strategies so that the extent of their impact on students can be

studied and modified accordingly with a view to promoting the growth of creativity in different fields.

8) Another interesting and worthwhile area for research study could be in the direction of identifying the problems/difficulties faced by creative individuals in diverse fields in their interaction with society at large and students, administrators and tutors in particular, which could be done through employing techniques like 'Interviews', 'Discussions', 'Problems checklists', and 'Inventories' respectively. This would prove useful insight for organizing guidance and remedial measures for the endangered minority and in understanding the springs of behaviour underlying creative behaviour in different fields of activity.

9) It is suggested that special programmes unique to each type of creativity be organized by institutions constructively engaged in the cause of educational and psychological research, for the identification, nurturance and monitoring of creative talent in different areas and at different levels of education not only to corroborate and replicate the results of the present investigation but also to bring more sophistication in research methodology and add to the present body of knowledge on the subject.

10) It is suggested that the scores on the four different tests of creativity be factor analysed to throw further light on the factorial structure of creative abilities in the field of science, mathematics, commerce and general field in order to differentiate one type of creativity from another.

11) It would be interesting to study some bio-medical and bio-chemical aspects of the phenomena of creativity. For this, an interdisciplinary research study may be initiated by ICSSR with the collaboration of ICMR.

12) There is a great need to start certain workshop-cum-training courses for teachers, administrators and social-scientists so as to give them training for nurturing creativity among their pupils and colleagues. In this context, it is suggested that ICSSR should take lead in arranging some workshops, conferences and training sessions under experts so that programme for creativity development may be concretely taken up. Alternatively, it may assign this job to competent institutions and individuals.

13) It will be worthwhile from the point of view of research, to undertake indepth analyses of the intellectual, aesthetic, emotional, cultural and physical correlates of Scientific, Mathematical and Entrepreneurial Creativity in order to make adolescents creative in the fields of Science, Mathematics and Commerce, aware of their unique talents. In this connection, more programmes need to be initiated and monitored for the enrichment and optimum enhancement of creative potential among adolescents talented in different fields.

14) It will also be useful to conduct studies to compare the patterns of adjustment, mental health, and degree of actualization of adolescents endowed with high Scientific, Mathematical, Entrepreneurial and General Creativity with a view to understanding their degree of self acceptance, actualization, satisfaction and inspiration. For the same reason it will be worthwhile to have indepth studies on the process of creativity unique to each type of creative activity, to distinguish it from creativity in another field.

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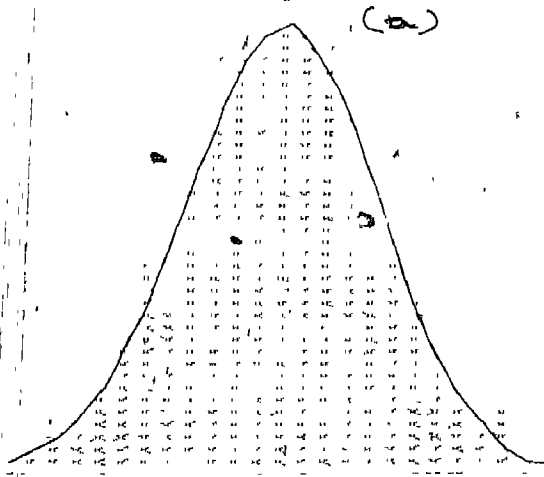
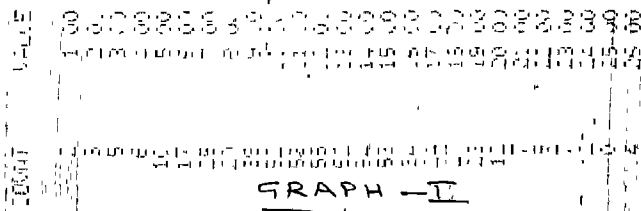
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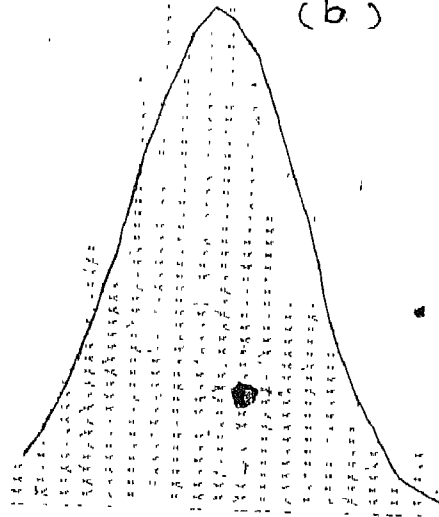
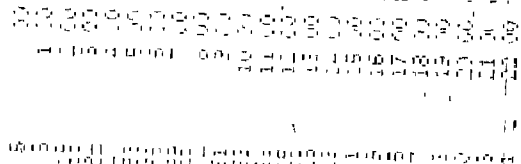
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APPENDICES

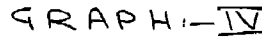
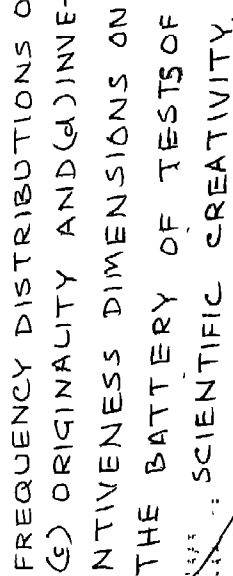
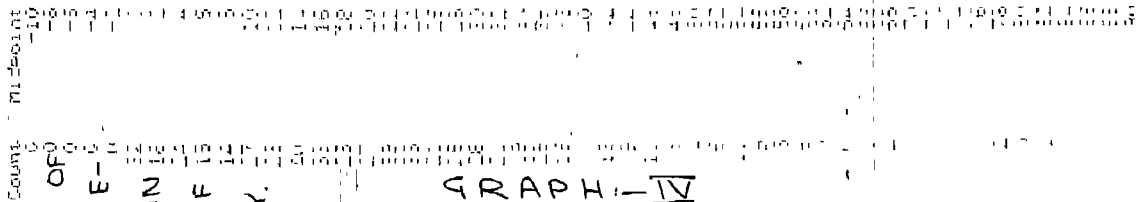
FREQUENCY DISTRIBUTIONS OF
(a) FLUENCY AND (b) FLEXIBILITY
DIMENSIONS ON THE BATTERY OF TESTS OF
SCIENTIFIC CREATIVITY.



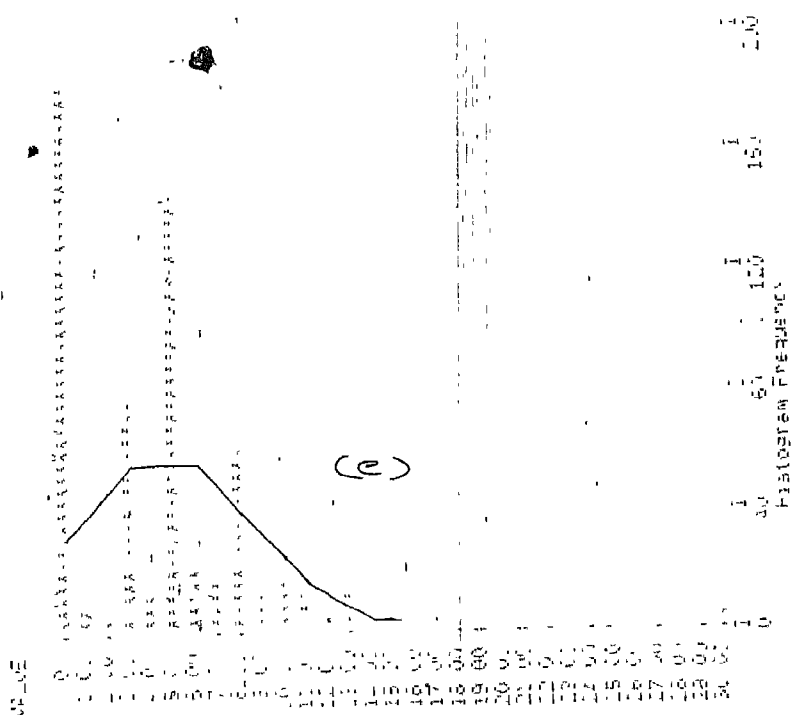
(G) GRAPH - II



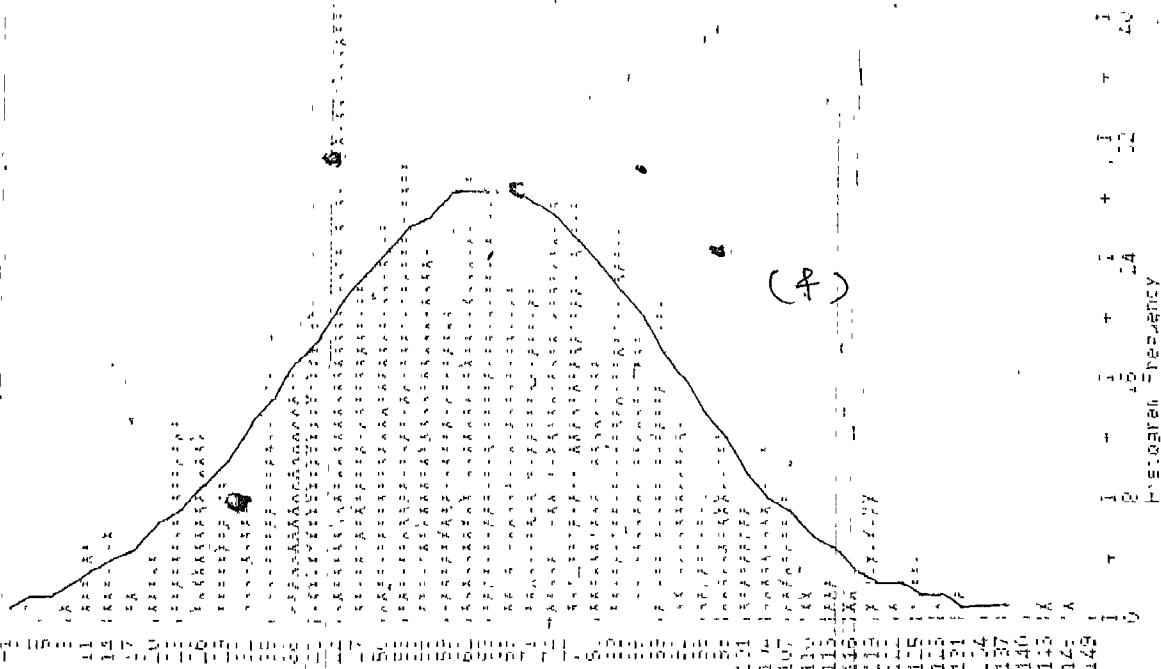
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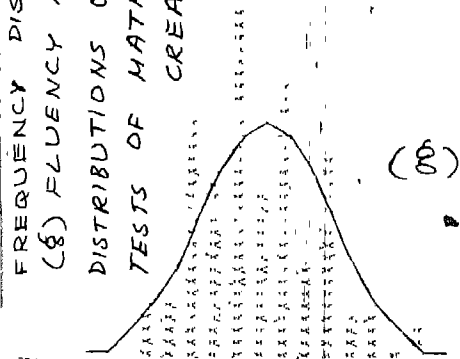
FREQUENCY DISTRIBUTIONS OF (e) PRO-
DUCTIVE DESIGNING ABILITY (f) TOTAL
SCIENTIFIC CREATIVITY SCORE
ON THE BATTERY OF
TESTS OF SCIENTIFIC CREATIVITY.



GRAPH VI

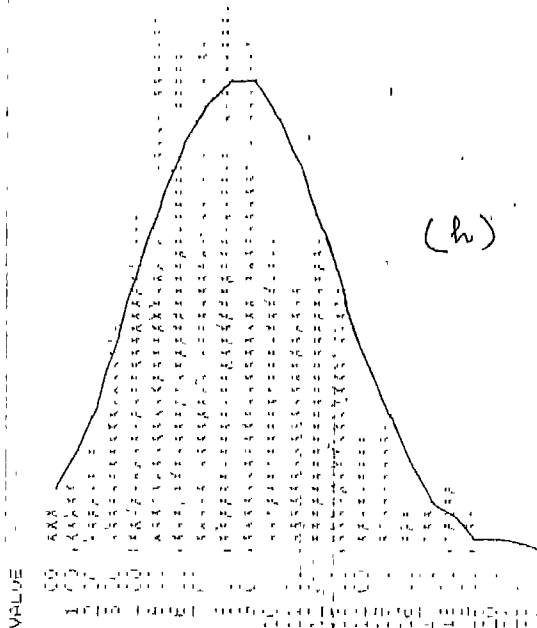


FREQUENCY DISTRIBUTIONS OF COUNT
(8) FLUENCY AND (2) FLEXIBILITY
DISTRIBUTIONS ON THE BATTERY OF
TESTS OF MATHEMATICAL
CREATIVITY.

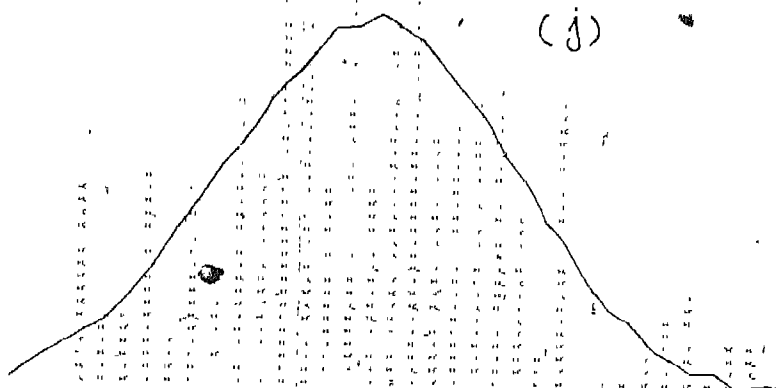


GRAPH VII

GRAPH VIII



(h)

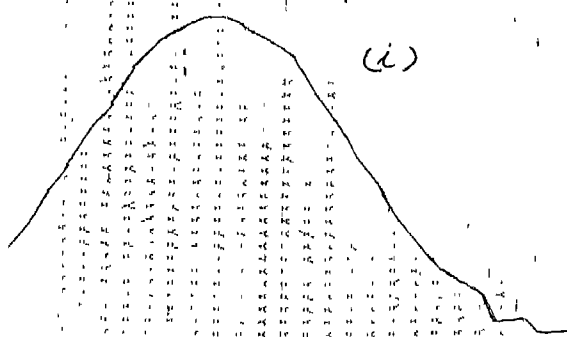


(j)

Frequency

GRAPH X

FREQUENCY DISTRIBUTIONS OF
(i) ORIGINALITY (j) TRANSFORMATION
DIMENSIONS ON THE BATTERY OF
TESTS OF MATHEMATICAL CREATIVITY

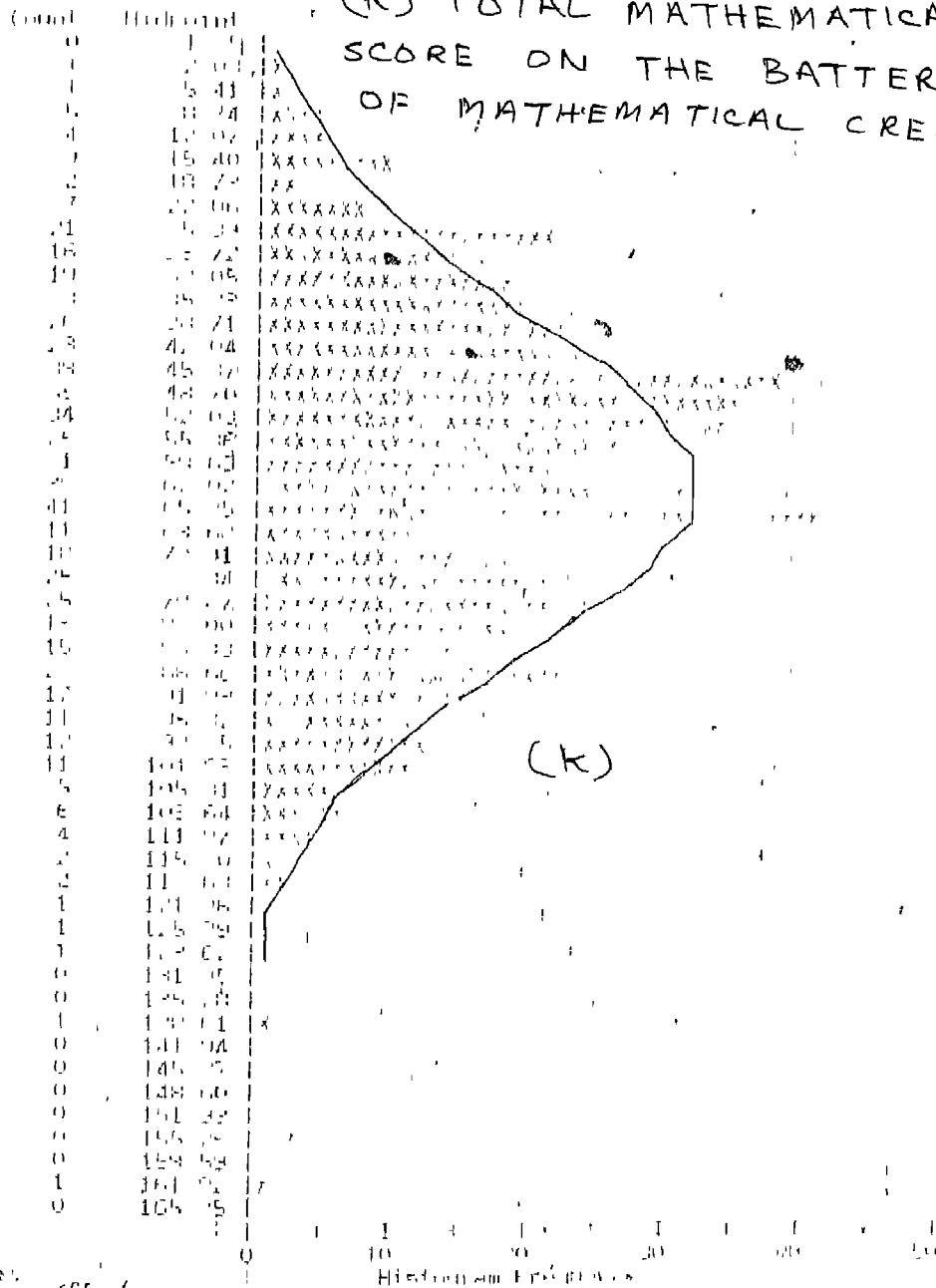


(i)

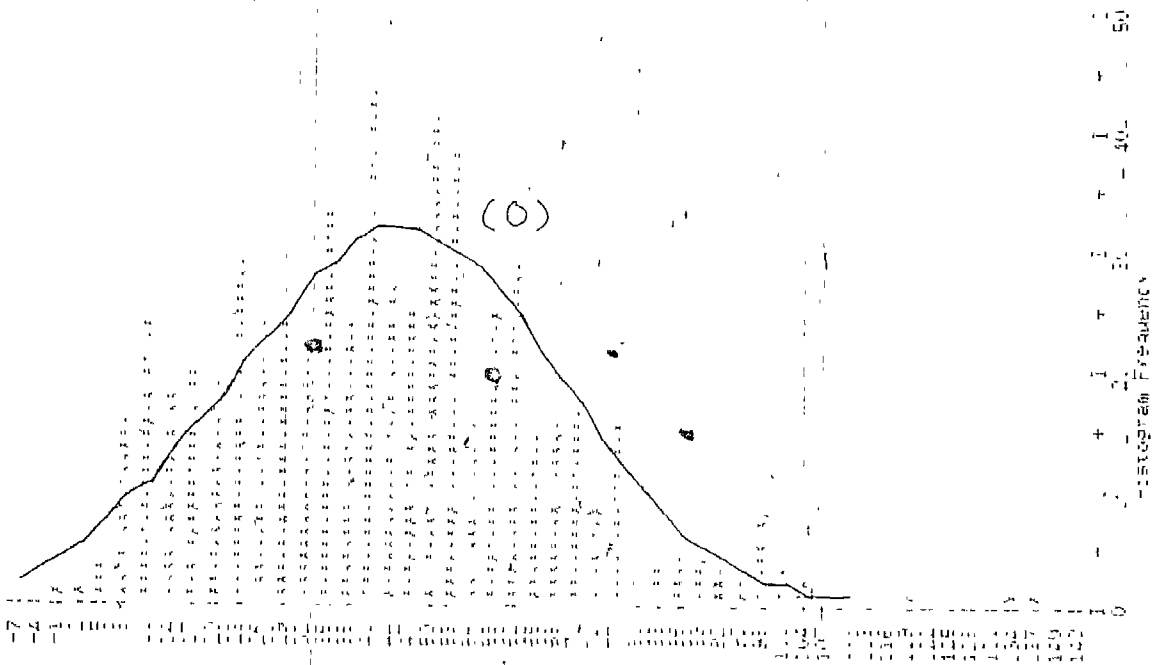
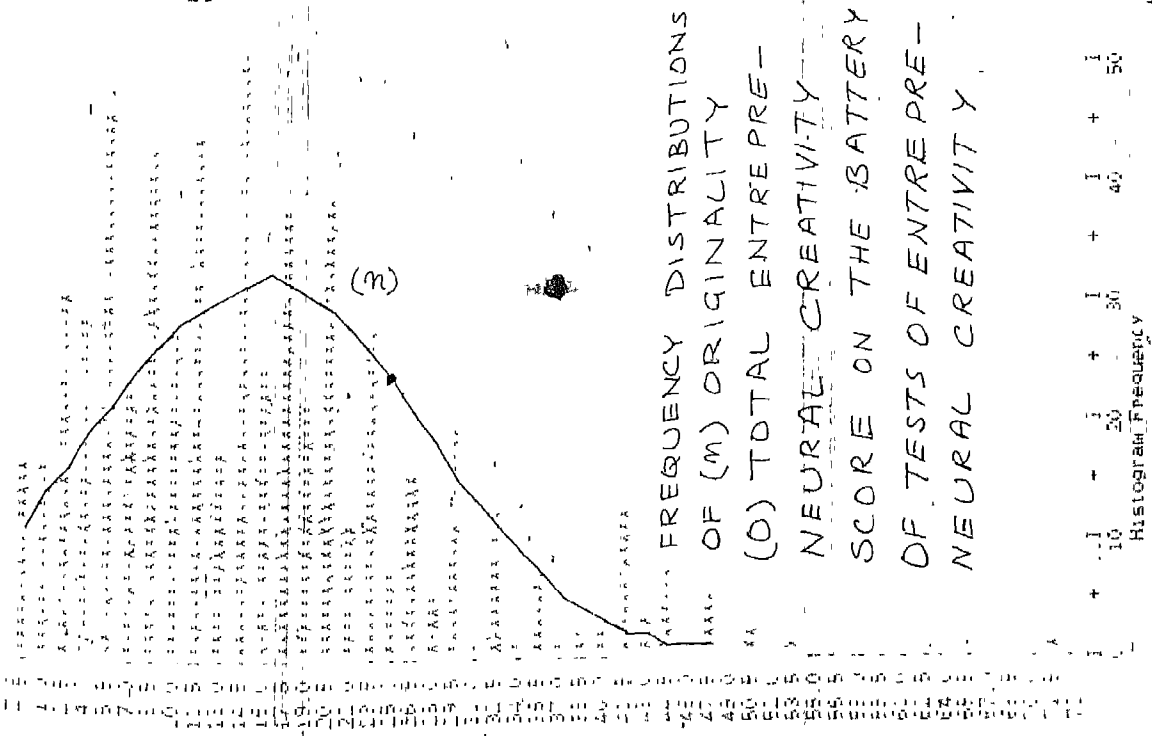
Frequency

GRAPH IV

FREQUENCY DISTRIBUTIONS OF (K) TOTAL MATHEMATICAL SCORE ON THE BATTERY OF TESTS OF MATHEMATICAL CREATIVITY.



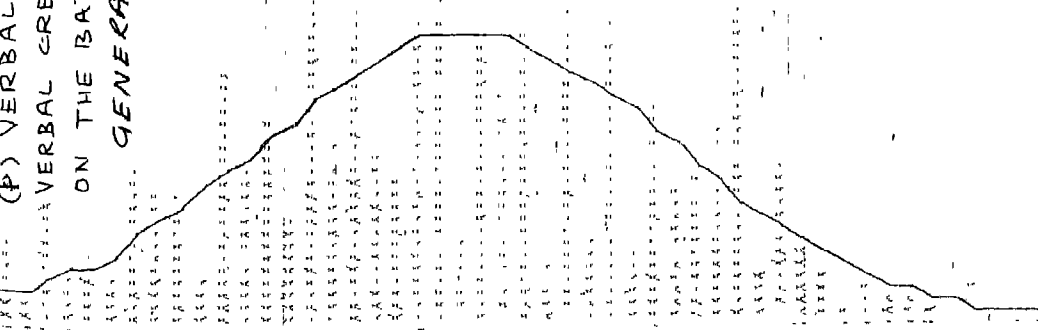
GRAPH XI

GRAPH XVGRAPH XIV

FREQUENCY DISTRIBUTIONS OF
(P) VERBAL CREATIVITY (9) NON-
VERBAL CREATIVITY
ON THE BATTERY OF TESTS OF
GENERAL CREATIVITY.

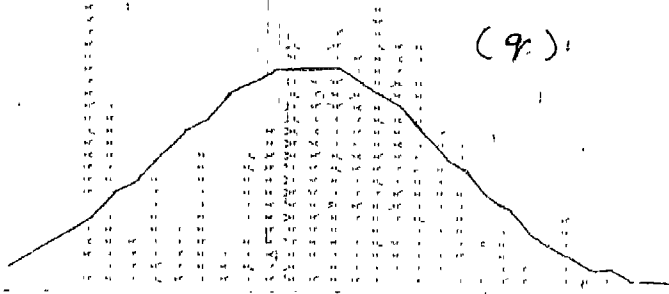
COUNT

MIDPOINT



GRAPH XVI

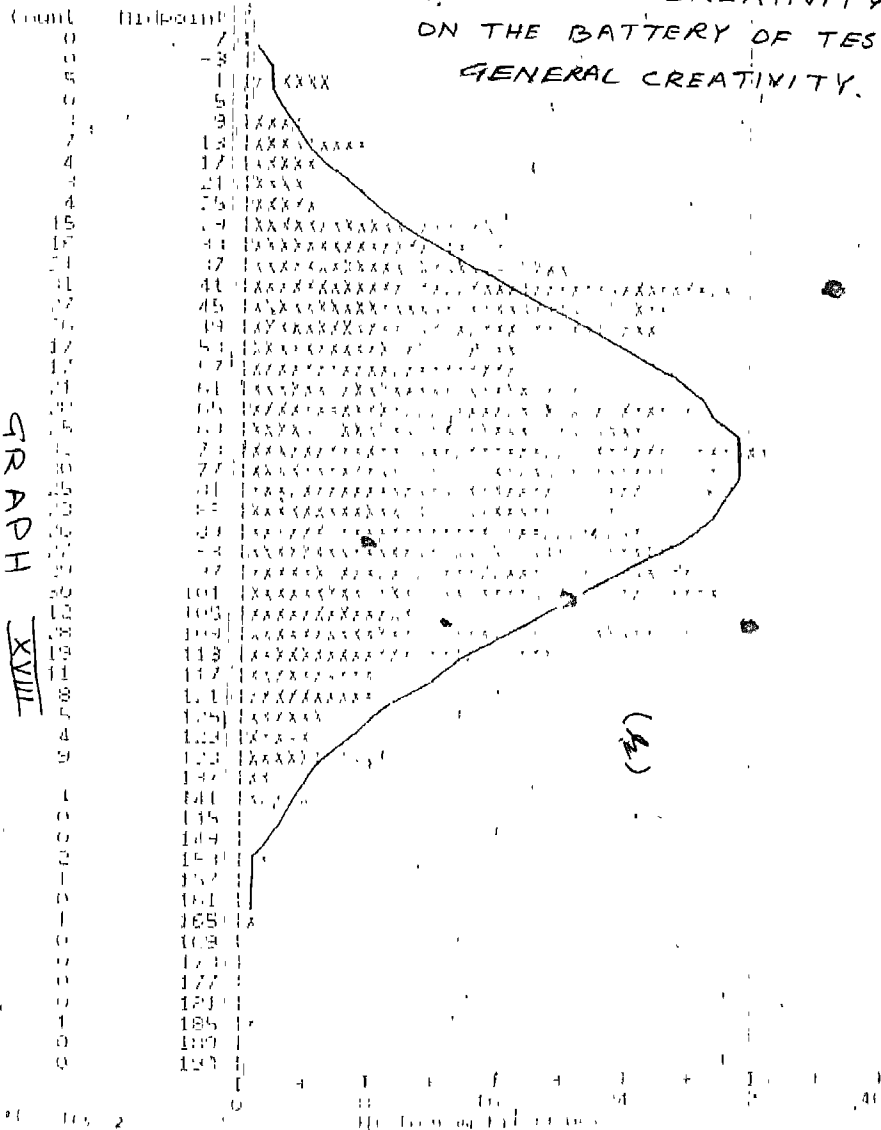
(9)



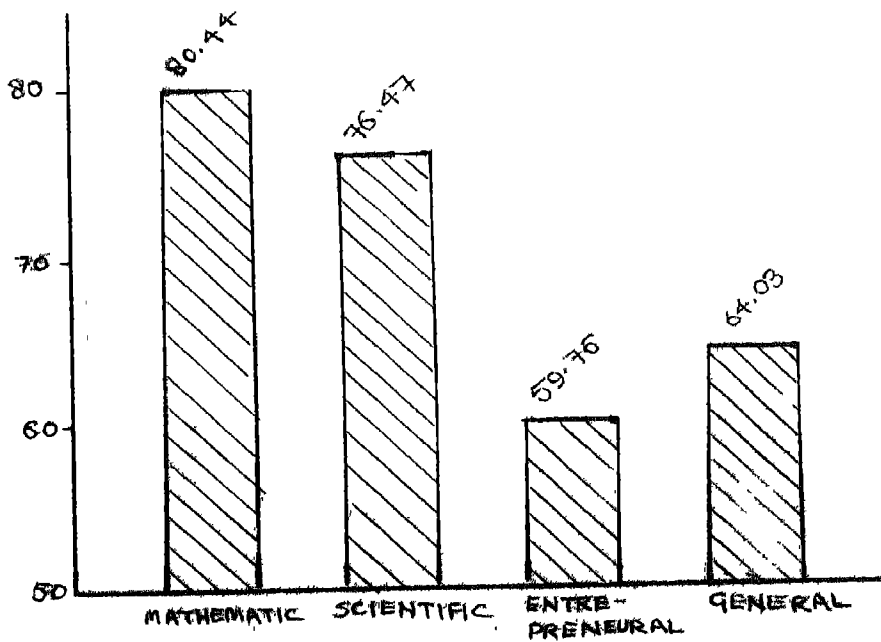
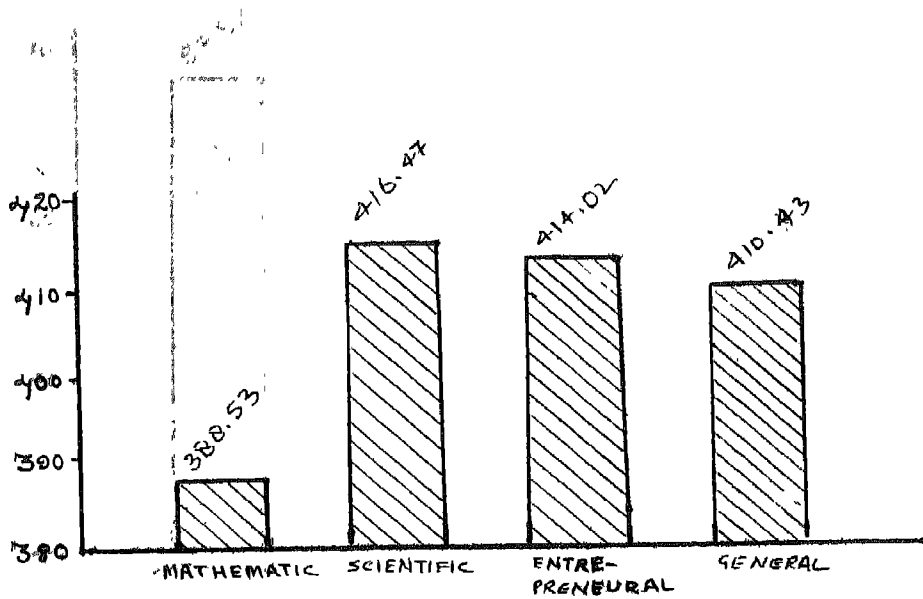
GRAPH XVII

(P)

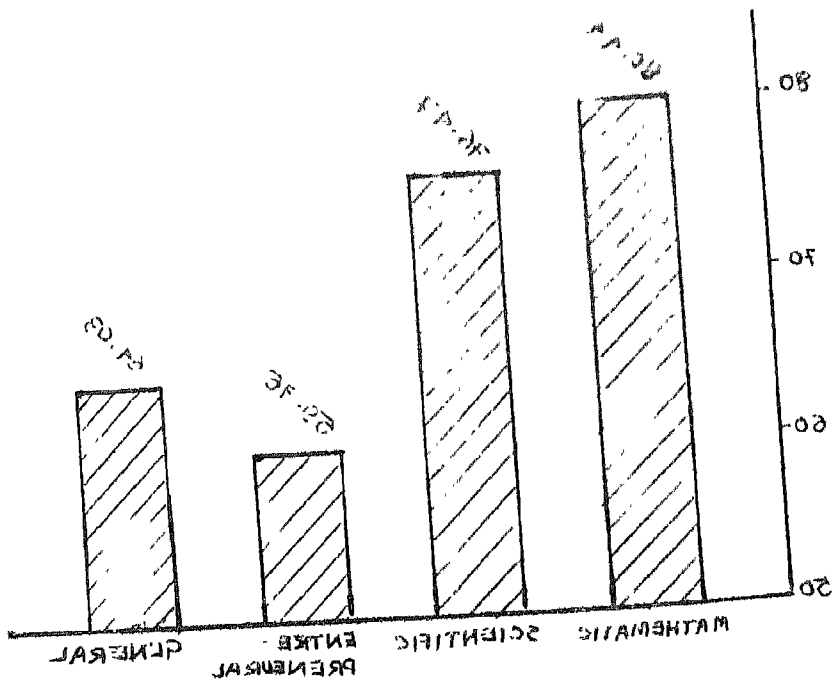
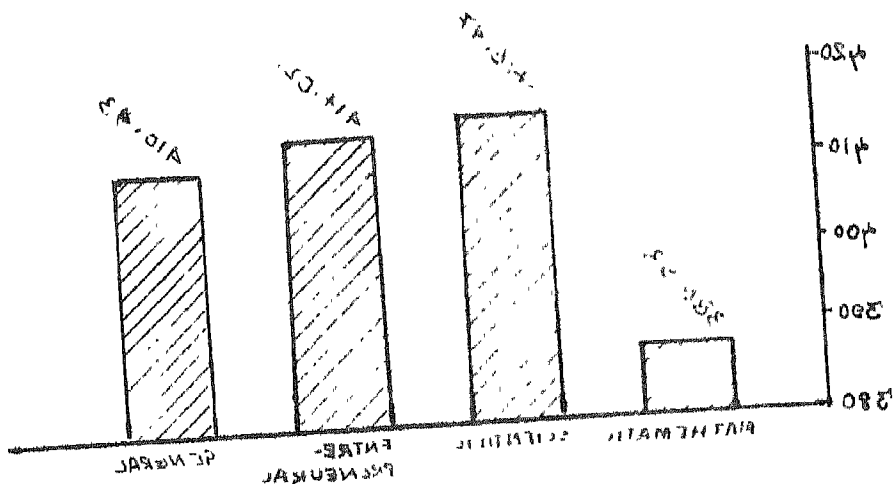
FREQUENCY DISTRIBUTIONS OF
(3) GENERAL CREATIVITY
ON THE BATTERY OF TESTS OF
GENERAL CREATIVITY.



INTER GROUP DIFFERENCES ON (a) INTER-PERSONAL
RELATIONS (b) ACHIEVEMENT AMONG ADOLESCENTS
ENDOWED WITH HIGH MATHEMATICAL, SCIENTIFIC,
ENTREPRENEURIAL AND GENERAL CREATIVITY.

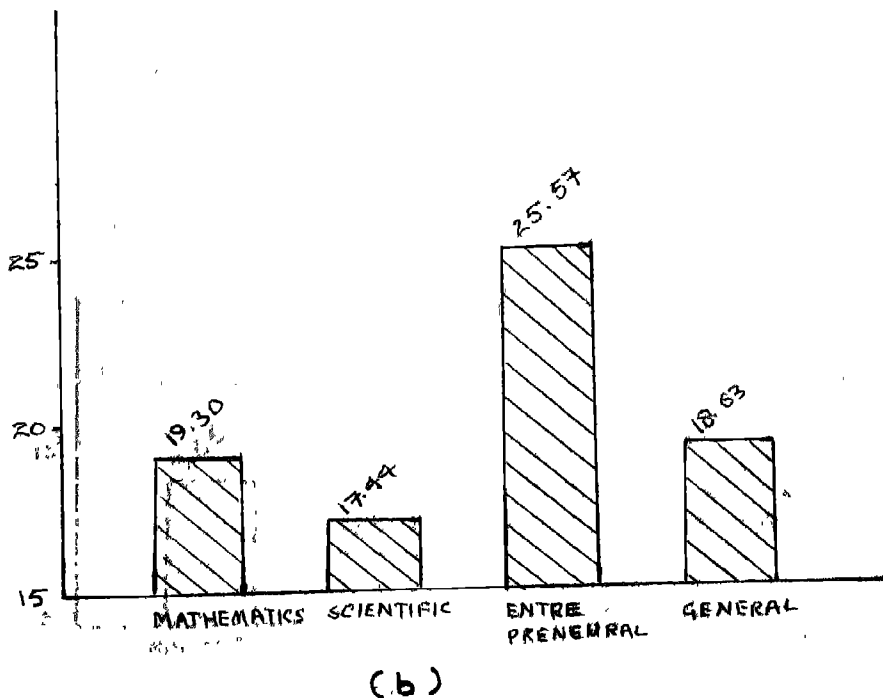
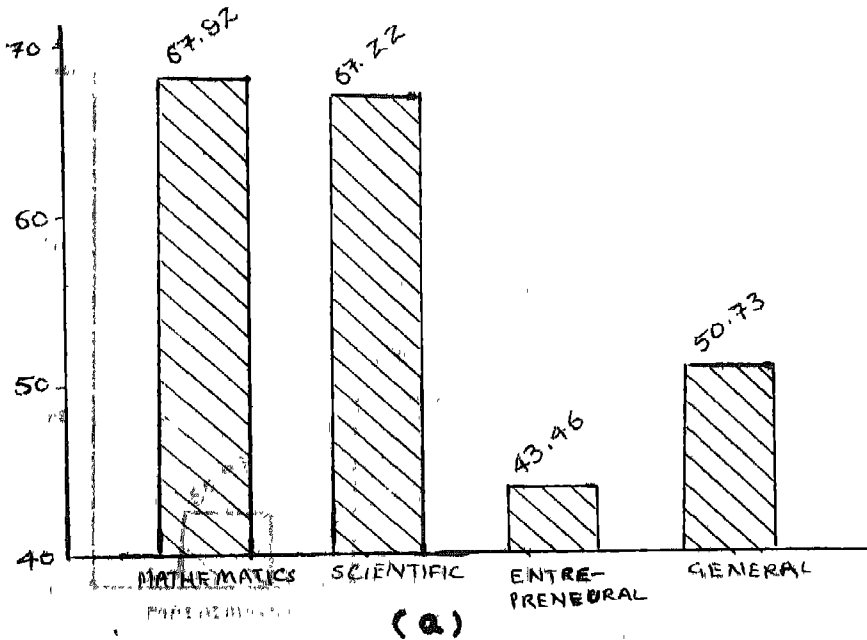


INTER GROUP DIFFERENCES ON (a) INTER-PERSONAL
RELATIONS (b) ACHIEVEMENT AMONG ADOLESCENTS
KNOWN WITH HIGH MATHEMATICAL, SCIENTIFIC,
GENERAL AND GENERAL CREATIVITY.

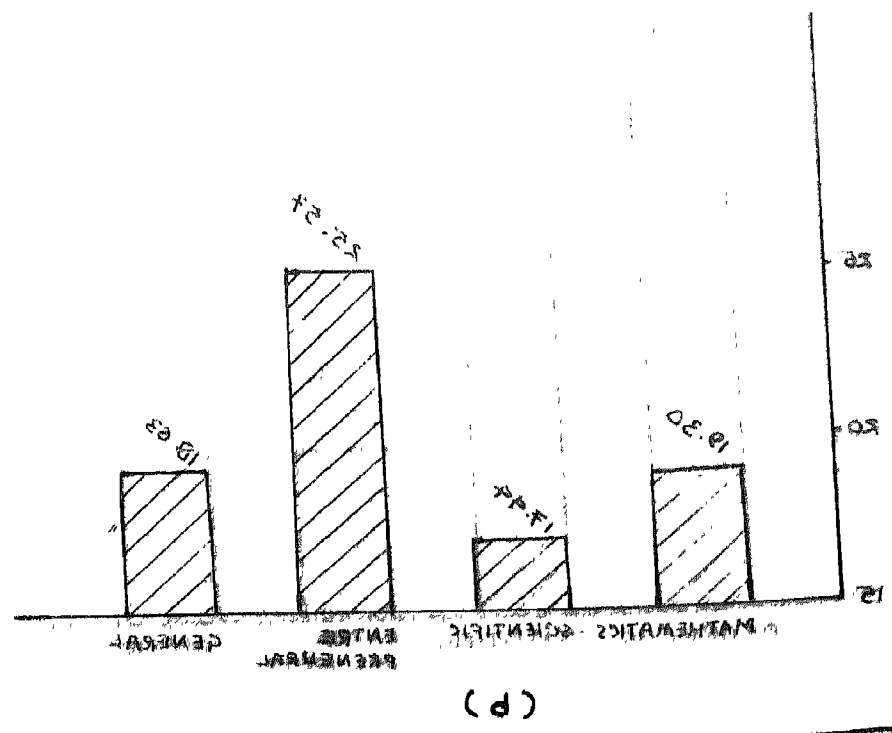
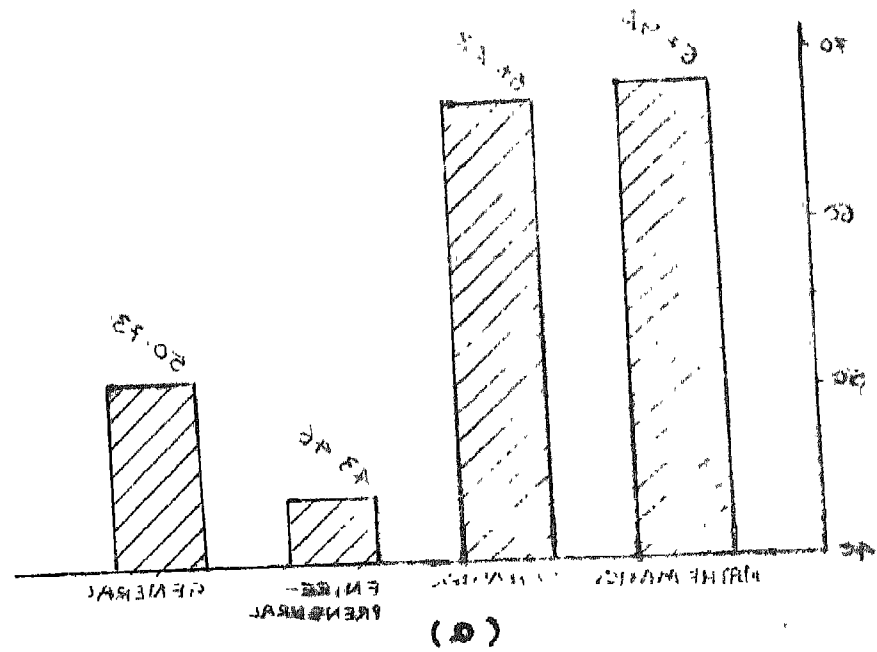


INTER GROUP DIFFERENCES ON (a) INTELLIGENCE
(b) SELF INITIATED ACTIVITIES AMONG ADOLESCENTS
ENDOWED WITH HIGH MATHEMATICAL, SCIENTIFIC,
ENTREPRENEURIAL AND GENERAL CREATIVITY

ADOLESCENTS
SCIENTIFIC
CREATIVITY



INTER GROUP DIFFERENCES BY (a) INTELLIGENCE
(b) SELF INITIATED ACTIVITIES AMONG ADOLESCENTS
ENDOWED WITH HIGH MATHEMATICAL, SCIENTIFIC,
ENTREPRENEURIAL AND GENERAL CREATIVITY



WORDS AND TERMS USED INTERCHANGEABLY IN THE PRESENT STUDY

INTER GROUP DIFFERENCES ON (a) TOTAL STUDY STRATEGIES (b) LOCUS OF CONTROL AMONG ADOLESCENTS ENDOWED WITH HIGH MATHEMATICAL, SCIENTIFIC, ENTREPRENEURAL AND GENERAL CREATIVITY and Overall Creativity

- i) General Creativity and Overall Creativity
- ii) Self Initiated Activities and Things Done on Your Own Checklist

iii) Adolescents at the +2 stage in education and Pupils / students at the +2 stage in education

iv) Intelligence and General Mental Ability

v) Study Habits and Study Strategy/Strategies

vi) 10+2 stage +2 stage

vii) Vocation and Profession

viii) Vocational Choices and Vocational Preferences

ix) Scientific Creativity, and Creativity in the field of Science/Sciences (a)

x) Mathematical Creativity and Creativity in the field of Mathematics

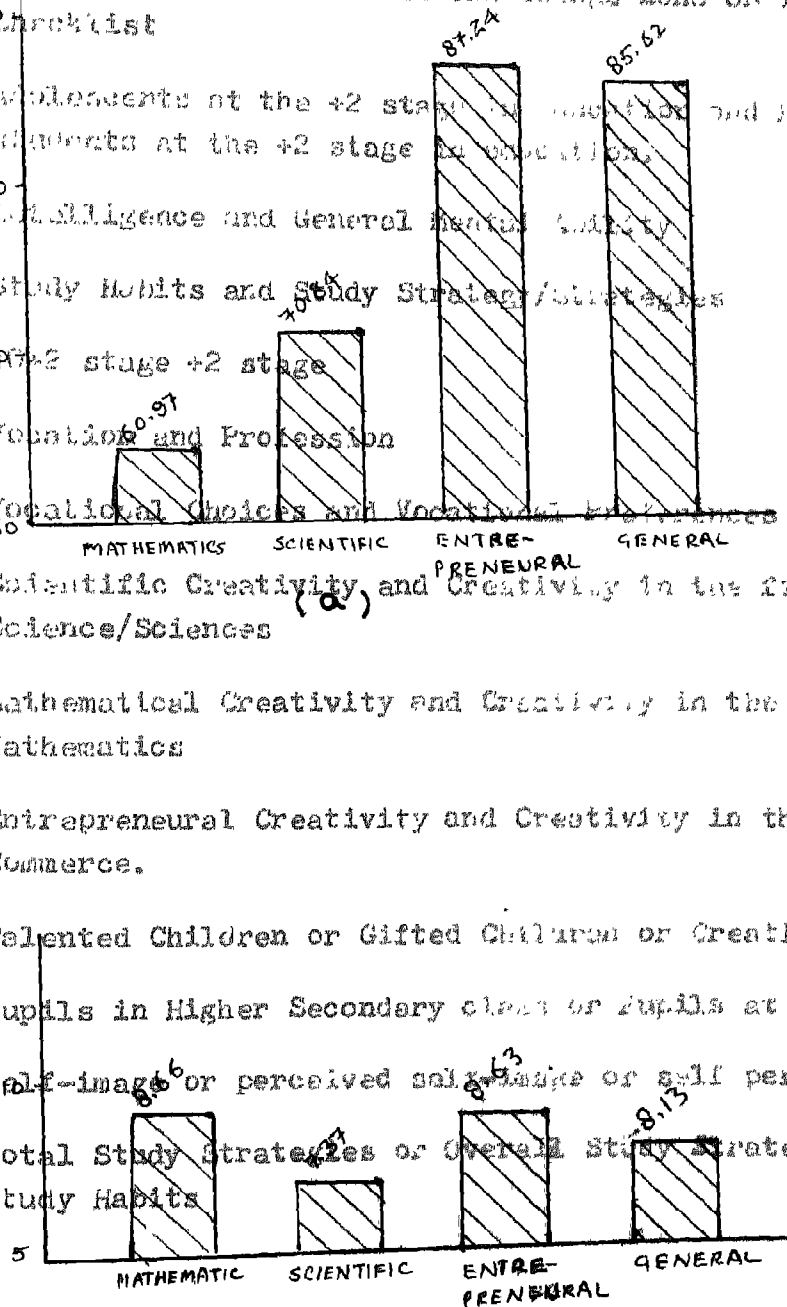
xi) Entrepreneurial Creativity and Creativity in the field of Commerce.

xii) Talented Children or Gifted Children or Creative Children

xiii) Pupils in Higher Secondary class or Pupils at 10+2 stage

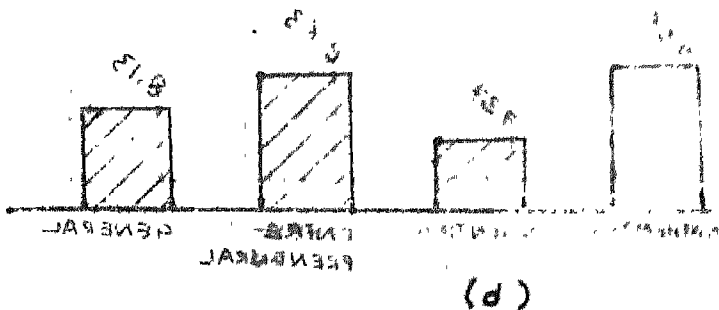
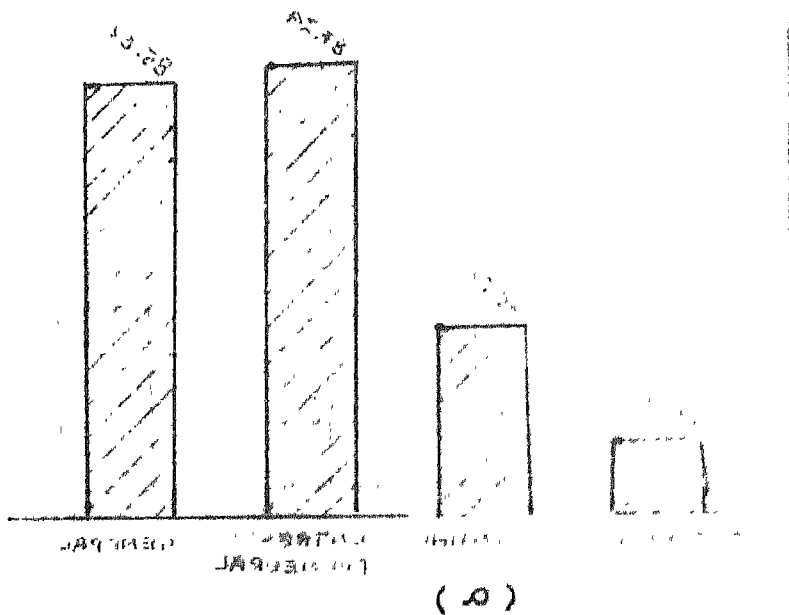
xiv) Self-image⁶ or perceived self-image⁶ or self perceptions

xv) Total Study Strategies or Overall Study Strategies or Study Habits



(b)

INTER GROUP DIFFERENCES ON (a) TOTAL STUDY
 GRADES (b) POINTS OF CONTROL AMONG
 SUBJECTS ENDOWED WITH HIGH MATHEMATICAL
 ABILITY IN GENERAL AND GENERAL



WORDS AND TERMS USED INTERCHANGEABLY IN THE PRESENT STUDY

- i) General Creativity and Overall Creativity
- ii) Self Initiated Activities and Things Done On Your Own Checklist
- iii) Adolescents at the +2 stage in education and Pupils/ students at the +2 stage in education.
- iv) Intelligence and General Mental Ability
- v) Study Habits and Study Strategy/Strategies
- vi) 10+2 stage +2 stage
- vii) Vocation and Profession
- viii) Vocational Choices and Vocational Preferences
- ix) Scientific Creativity and Creativity in the field of Science/Sciences
- x) Mathematical Creativity and Creativity in the field of Mathematics
- xi) Entrepreneurial Creativity and Creativity in the field of Commerce.
- xii) Talented Children or Gifted Children or Creative Children
- xiii) Pupils in Higher Secondary class or Pupils at 10+2 stage
- xiv) Self-image or perceived self-image or self perceptions
- xv) Total Study Strategies or Overall Study Strategies or Study Habits

xvi) Total Inter Personal Relations or Overall Inter Personal relations

xvii) Achievement or Academic Achievement.

APPENDIX 2 :
TESTS OF SCIENTIFIC CREATIVITY

I N T R O D U C T I O N S

In the booklet, we shall ask you to do some interesting, enjoyable and clever activities. You will be required to write your ideas or responses on the pages of the sheets provided to you. With the help - - - of your imagination, originality, sharp brain and thinking ability, try to give as many clever, interesting, different and unusual ideas and responses (to all activities) which you and you alone are capable of thinking. There are no right or wrong answers or ideas related to any activity. We just want to know how many relevant, different, original, novel creative unusual types of ideas you can think of.

The time limits have been fixed for writing your responses in the different activities which shall be indicated to you when you start writing your answers. Therefore, do not waste your precious time. Think and imagine your answer in such a manner so that you may be able to give the maximum possible number of clever, novel, original and unusual ideas/responses in the given time.

If you feel any difficulty in doing your work at any stage, you may take our help. However, try to understand everything and be attentive while reading and following the different instructions; this would save your precious time.

If you complete your work as per the instructions, before the time for an activity is over, you may revise what you have written and improve upon or change your ideas. You may also just sit and think till more ideas come to you/ so that you may add these to the answers already given by you. In no case however, should you turn to the next page of the booklet unless you are asked to do so.

SC - 1

As the most physicist of your country, identify as many important, new and different problems in the field of "mechanics" which, according to your knowledge, require immediate attention and solution by physicists all over the world. Identify as many different problems as possible for the guidance of the scientists in the given time limit. Remember that the problems identified should be scientific, which only a scientist should be able to identify. There should belong to the field of mechanics only.

Use your imagination, scientific study, keen observation and originality to give your responses. You may use scientific language/terms and expressions etc. in your answers if you so desire.

Time limit : 10 minutes

IMPORTANT

- Write your answers on the response sheet only;
- Do not write on this booklet;
- Do not write anything on this page;
- Do not turn this page unless instructed to do so.

SC - 2

Suppose for once that there is no friction on earth. As a science student, write the maximum number of different but important effects/changes in the practicals you do in your institution's laboratory that would be brought about by "zero friction conditions". Remember that every effect mentioned by you should be scientific in nature. Use your imagination, scientific thinking, keen observation and originality to write important effects/changes due to zero friction which you and you alone as a scientist may be able to perceive and imagine. You may use scientific language/terms and expressions in giving your responses if you so like.

Time limit : 10 minutes

IMPORTANT

1. Write your answers on the response sheet only;
2. Do not write anything on this page;
3. Do not turn this page unless instructed to do so.

SC - 3

A team of topmost scientists from all over the world is selected for space exploration to other planets. Being a "Noble prize winner" in Chemistry, you are also selected as one of the members of this world team. The planet where you are supposed to go for exploration is outside our solar system where no man has ever gone before. For this space trip, you have been advised to select any ten scientific instruments/apparatus of your own choice which you consider essential for conducting scientific experiments in your field of specialization.

In the given time limit, write the names of ten (10) scientific instruments/apparatus which you would like to carry for the proposed trip. The apparatus/instruments should be light weight, handy, sophisticated and multipurpose so that maximum, new and valuable information in the field of chemistry can be gathered. You may use scientific language/terms and expressions in giving your responses if you so like.

Time limit : 10 minutes

IMPORTANT

1. Write your answers on the response sheet only;
2. Do not write anything on this page;
3. Do not turn this page unless instructed to do so.

SC - 4

Suppose, you are a great scientist. After your hardwork and labour, you have succeeded in inventing a method or a technique for preparing/manufacturing a medicine called "Endometroni^ocine" (which can cure all the diseases). In order to announce your discovery to the world, name the different substances, materials and the things from which this medicine "Endometroni^ocine" can be prepared/manufactured. Try to imagine and write such names as are unique, original, scientific, and clever and which no body else may even think of. You may use scientific language/terms and expression in giving your responses if you so like.

Time limit : 5 minutes.

IMPORTANT

1. Write your answers on the response sheet only;
2. Do not write anything on this page;
3. Do not turn this page unless instructed to do so.

SC - 5

Suppose, you are a great scientist and that, you have, after years of hardwork and labour, succeeded in inventing a unique technique/process/method, for preparing or manufacturing a medicine called "Endometroniocine" which can cure all the diseases. In order to announce your discovery to the world, write how "Endometroniocine" can be prepared (i.e. stages, or the process by following which the ~~medicine~~ can be prepared or manufactured). Try to imagine a clever, unique, original and scientific process for preparing/manufacturing the said medicine. You may use scientific language/terms and expressions in giving your responses if you so like.

Time limit : 10 minutes

IMPORTANT

1. Write your answers on the response sheet only;
2. Do not write anything on this page;
3. Do not turn this page unless instructed to do so.

SC - 6

Suppose, you are a great scientist and that, you have, after years of hardwork and labour, succeeded in inventing a unique method or technique for preparing/manufacturing a medicine called "Endometron^oicine" (which can cure all diseases). To prepare or manufacture that medicine, you have also designed a complex machine or apparatus.

Draw the sketch or outline of the complex machine or apparatus in which this medicine (Endometro~~ni~~icine) can be prepared. Using your imagination, inventiveness and your designing ability, also write the name of different parts of that machine. Use the space provided in the response sheet.

Time limit : 15 minutes

IMPORTANT

1. Write your answers on the response sheet;
2. Do not write anything on this page;
3. Do not turn this page unless instructed to do so.

TESTS OF MATHEMATICAL CREATIVITYI N S T R U C T I O N S

In this booklet, we shall ask you to do some interesting, enjoyable and clever activities. You will be required to write your ideas or responses on the pages of the sheets provided to you. With the help - - - of your imagination, originality, sharp brain and thinking ability, try to give as many clever, interesting, different and unusual ideas and responses (to all activities) which you and you alone are capable of thinking. There are no right or wrong answers or ideas related to any activity. We just want to know how many relevant, different, original, novel, creative and unusual types of ideas you can think of.

The time limits have been fixed for writing your responses in the different activities which shall be indicated to you when you start writing your answers. Therefore, do not waste your precious time. Think, and imagine your answer in such a manner, so that you may be able to give the maximum possible number of clever, novel, original and unusual ideas/responses in the given time.

If you feel any difficulty in doing your work at any stage, you may take our help. However, try to understand everything and be attentive while reading and following the different instructions; this would save your precious time.

If you complete your work as per the instructions, before the time for an activity is over, you may revise what you have written and improve upon or change your ideas. You may also just sit and think till more ideas come to you/ so that you may add these to the answers already given by you. In no case however, should you turn to the next page of the booklet unless you are asked to do so.

MC - 1

Divide the given geometrical figure of a circle into as many parts as possible so that each divided part represents a different geometrical figure in itself. Credit shall be given for dividing the circle into maximum number of geometrical figures each different from one another. Give the total number of different geometrical shapes formed after dividing the circle. Use your imagination, keen observation and originality to divide the figure.

Time limit : 10 minutes

IMPORTANT

1. Do not write anything on this booklet;
2. Do not turn this page unless instructed to do so.

MC - 2

Complete as many of the following squares as possible with appropriate numbers from your side in such a manner that each line both horizontally, vertically and both the diagonals total 15. For this purpose, you may use any integer from 1 to 9 in any arrangement you like keeping in view the following conditions.

1. No integer should be used more than twice in the square in a particular arrangement;
2. Each arrangement should be different from one another and new;
3. Create as many different arrangements as you possibly can within the given time limit but the total of each row/diagonal/column in every case should be 15 only.
4. Only integers from 1 to 9 are to be used. Use of Zero is permitted only once in a particular square.

Example :

					= 15				
<hr/>									
	4				3			8	
<hr/>									
	9				5			1	
<hr/>									
	2				7			6	
<hr/>									
					= 15				

Time limit : 15 minutes.

IMPORTANT

1. Do not write anything on this booklet;
2. Do not turn this page unless instructed to do so.

1111

MC - 3

By using integers from 1 to 9 only and the seven symbols that of decimal (.), Square root ($\sqrt{\quad}$) Addition (+), Subtraction (-), Square (\square)². Product (X), and Division (\div) respectively, make as many mathematical expressions as you can, each amounting to the given value 20.

$$3(4^2 - 3 \times 4) + \sqrt{16} (2.4 + 3 \div 6) \div 3 = 20$$

Frame as many new, different and possible expressions as possible. Use your imagination, mathematical thinking and originality to use maximum possible numbers of symbols and integers in each equation. A particular symbol or integer should not be used more than two times in the same expression.

Time limit : 25 minutes.

IMPORTANT

1. Do not write anything on this booklet;
2. Do not turn this page unless instructed to do so.

APPENDIX :
TESTS OF ENTREPRENEURIAL CREATIVITY

I N S T R U C T I O N S

In this booklet, we shall ask you to do some interesting, enjoyable and clever activities. You will be required to write your ideas or responses on the pages of the sheets provided to you. With the help - - - of your imagination, originality, sharp brain and thinking ability, try to give as many clever, interesting, different and unusual ideas and responses (to all activities) which you and you alone are capable of thinking. There are no right or wrong answers or ideas related to any activity. We just want to know how many relevant, different, original, novel creative and unusual types of ideas you can think of.

The time limits have been fixed for writing your responses in the different activities which shall be indicated to you when you start writing your answers. Therefore, do not waste your precious time. Think and imagine your answer in such a manner so that you may be able to give the maximum possible number of clever, novel, original and unusual ideas/responses in the given time.

If you feel any difficulty in doing your work at any stage, you may take our help. However, try to understand everything and be attentive while reading and following the different instructions; this would save your precious time.

If you complete your work as per the instructions, before the time for an activity is over, you ^{may} revise what you have written and improve upon or change your ideas. You may also just sit and think till more ideas come to you/ so that you may add these to the answers already given by you. In no case however, should you turn to the next page of the booklet unless you are asked to do so.

"CHARACTERISTICS OF AN IDEAL MODERN ENTERPRISING BUSINESSMAN".

In the given time duration, write the maximum possible characteristics of an ideal enterprising businessman for today's world. Each characteristic should be different from the other, novel, unique, and realistic which you and you alone may be able to think of. Use your imagination, knowledge of commerce and originality to give your responses.

Time limit : 10 minutes.

IMPORTANT

1. You may use commercial language/terms in your responses if you so like;
2. Do not write anything on this booklet;
3. Do not turn over this page unless instructed to do so.

As a very successful and enterprising businessman you are asked to identify the maximum possible problems which a new business firm (about to start manufacture of a fast selling consumer product for the first time in your country) is likely to face from planning to the production stages. Each problem should be new, different from one another and significant, upon which the production and output of the factory may depend. Use your originality, imagination and entrepreneurial ability to give your responses in the given time.

Time limit : 5 minutes.

IMPORTANT

1. You may use commercial language/terms in your responses if you so like;
2. Do not write anything on this booklet;
3. Do not turn over this page unless instructed to do so.

EC - 3

As a very big industrialist who has vast experience in setting up large factories, your name is included in a high power Commission to investigate as to why a particular Government Company set up with huge financial investment of Rs.50/ crore is not making the anticipated profit. For this purpose, you are supposed to visit the factory on a working day.

In the given time period, write what different aspects/ operations/things will you inspect so that maximum possible and wide ranging information can be received by you to enable you to prepare a detailed report on the performance of the factory. Each field or aspect should be different from one another and should yield the maximum possible, new and different information on the sick unit. Utilize your imagination, knowledge of commerce and originality to identify the different areas/aspects you would like to inspect.

Time limit : 15 minutes.

IMPORTANT

1. You may use commercial language/terms in your responses if you so like;
2. Do not write anything on this page;
3. Do not turn over this page unless instructed to do so.

After having received your higher education in business management in a foreign country, you return to your own country and are appointed as the Marketing Manager-cum-partner in a big firm which is engaged in the task of manufacturing a new fast selling product for the market. You are entrusted the job of planning the marketing of the goods produced in factory so that in one year, your organization should be able to capture the whole market resulting in huge profits and further promotion to you. In the given time period, write as many new and different methods as possible which you would adopt to increase the scale of your product. Each method or plan should be different from each other, novel, effective and original - something which you and you alone can think of, as a marketing manager.

Time limit : 20 minutes.

IMPORTANT

1. You may use commercial language/terms in your responses if you so like;
2. Do not write anything on this booklet;
3. Do not turn this page unless instructed to do so.

"THINGS DONE ON YOUR OWN CHECKLIST"

NAME _____ GRADE _____ SCHOOL _____
 DATE _____ ROLL NO: _____

DIRECTIONS:- Below is a list of activities boys and girls do on their own. Indicate which ones you have done during this school term by checking the blank at the left. Include only the things you have done on your own, not the things you have been assigned or made to do.

- | | |
|--------------------------|---|
| <input type="checkbox"/> | 1. Wrote a poem/story/play. |
| <input type="checkbox"/> | 2. Kept a collection of my writings. |
| <input type="checkbox"/> | 3. Produced a puppet show. |
| <input type="checkbox"/> | 4. Kept a diary for at least a month. |
| <input type="checkbox"/> | 5. Played word games with other boys and girls. |
| <input type="checkbox"/> | 6. Recorded on a tape recorder, an oral reading, dialogue, story, discussion or the like. |
| <input type="checkbox"/> | 7. Found errors in fact or grammar in newspapers or other printed matter. |
| <input type="checkbox"/> | 8. Acted in a play or a skit, or directed or organized a play or skit. |
| <input type="checkbox"/> | 9. Made up and sang a song. |
| <input type="checkbox"/> | 10. Made up a new game and taught it to someone else. |
| <input type="checkbox"/> | 11. Made up an original dance. |
| <input type="checkbox"/> | 12. Visited a Zoo. |

Contd...

13. Explored a cave.
14. Read a science book/magazine.
15. Mixed colours.
16. Made a fire cracker.
17. Printed photographs.
18. Made a leaf collection.
19. Made a musical instrument.
20. Planned and experimented.
21. Took black and white photographs.
22. Dissected an animal.
23. Grafted a plant or rooted one from cutting.
24. Used a magnifying glass.
25. Made Ink.
26. Used a magnet.
27. Raised rats, mice, rabbits or guinea pigs.
28. Collected insects.
29. Collected rocks.
30. Been a bird watcher.

Contd...



- ☐ 31. Attended a science fair or display,
- ☐ 32. Constructed a model air plane.
- ☐ 33. Made a stamp collection.
- ☐ 34. Organised or helped to organize a club.
- ☐ 35. Served as officer in a club organized by boys and/or girls.
- ☐ 36. Figured out a way of improving a game we play at school or at home.
- ☐ 37. Solved a problem about getting along with other girls and boys.
- ☐ 38. Wrote a letter to someone in another country.
- ☐ 39. Made my own decision about the use of money.
- ☐ 40. Asked questions about the way some business operates.
- ☐ 41. Made a poster for some club, school or other event.
- ☐ 42. Sketched a landscape with pencil and/or charcoal.
- ☐ 43. Developed a design for cloth.
- ☐ 44. Illustrated a story of my own, or one in a book.
- ☐ 45. Drew cartoons.
- ☐ 46. Designed greeting cards for some holiday as special event

Contd...

- , 47. Made a water colour painting of a familiar scene.
 ,
- , 48. Made a toy for a child.
 ,
- , 49. Made a wood carving.
 ,
- , 50. Made a basket for ornamental purposes.
 ,

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PLEASE FILL IN THE FOLLOWING PARTICULARS

Name _____ Age _____ Sex _____
College/School/Department _____ Class _____ Section _____
Date _____ Residence _____ (Rural/Urban)

PERSONALITY WORD LIST

by

Dr. (MRS.) PRATIBHA DEO

Please read the directions carefully before writing anything on this card.

DIRECTIONS :

1. Please fill in the particulars on the top portion of the card before giving any further response.
2. On the next page, there is a list of words containing common adjectives. This will help us in finding out what you think of yourself.
3. The information collected through this list will be kept strictly confidential and will never be used to your disadvantage. The purpose of this list is to try to help you.
4. Please be frank and honest in your responses, because the results are likely to be useful in your better adjustment.
5. Work quickly and do not spend too much time on any single word.
6. There is no time-limit and no right and wrong answer.
7. Read the first word and put a cross in the square before the word (like this ☐) if you think that the word describes yourself most of the time (for perceived self). Then go over to the next word and in this fashion, complete the list of words by giving your responses.
8. If you think that the word does not apply to you, leave the square blank.

P W L

- | | |
|-------------------|-------------------------|
| () graceful | () polite |
| () cheerful | () versatile |
| () intelligent | () boastful |
| () aggressive | () co-operative |
| () kind | () shy |
| () conservative | () extremist |
| () sensitive | () simple |
| () artistic | () awkward |
| () brave | () self-controlled |
| () likable | () confident |
| () narrow-minded | () maladjusted |
| () inefficient | () unreliable |
| () happy | () fair-minded |
| () systematic | () spendthrift |
| () miser | () impatient |
| () irresponsible | () noble |
| () attractive | () clean |
| () nervous | () sarcastic |
| () persevering | () informal |
| () unselfish | () talkative |
| () irritable | () lazy |
| () enthusiastic | () intolerant |
| () suggestible | () conscientious |
| () dependent | () affectionate |
| () wise | () conventional |
| () pretending | () reliable |
| () careless | () generous |
| () lenient | () diffident |
| () dishonest | () straightforward |
| () profound | () alert |
| () impulsive | () resourceful |
| () serious | () unsympathetic |
| () prejudiced | () mature |
| () tardy | () modest |
| () critical | () realistic |

P W L

- | | |
|-------------------|-------------------|
| () fussy | () quiet |
| () charitable | () unclean |
| () obstinate | () frank |
| () religious | () responsible |
| () delicate | () unkind |
| () impractical | () optimistic |
| () expressive | () hateful |
| () reasonable | () conceding |
| () indisciplined | () energetic |
| () friendly | () foolish |
| () scrupulous | () active |
| () vague | () patient |
| () adventurous | () commoner |
| () reticent | () sincere |
| () human | () moderate |
| () lethargic | () excitable |
| () steady | () formal |
| () manly | () clever |
| () anxious | () bold |
| () social | () unsteady |
| () unexitable | () unreasonable |
| () superior | () stern |
| () complacent | () argumentative |
| () curious | () jealous |
| () regardless | () uncritical |
| () determined | () disciplined |
| () greedy | () cautious |
| () chivalrous | () incompetent |
| () forceful | () ambitious |
| () snobbish | () quarrelsome |
| () inactive | () carefree |
| () considerate | () independent |
| () relaxed | () assuming |

Contd...

P W L

- | | |
|--------------------|----------------------|
| () unirritable | () interests narrow |
| () womanly | () soft |
| () unsystematic | () open-minded |
| () tense | () unartistic |
| () self-pitying | () careful |
| () atheist | () yielding |
| () grudging | () strict |
| () efficient | () dull |
| () unhappy | () progressive |
| () industrious | () inhuman |
| () confused | () obedient |
| () thoughtful | () unlikable |
| () superficial | () shirker |
| () easy going | () trusting |
| () unenthusiastic | () unattractive |
| () suspicious | () humorous |
| () poised | () clear thinking |
| () absent-minded | () mischievous |
| () well adjusted | () restless |
| () coward | () bossy |
| () immodest | () unemotional |
| () sympathetic | () selfish |
| () weak | () rude |
| () inventive | () wavering |
| () sophisticated | () inhibited |
| () unimpressive | () unassuming |
| () honest | () practical |
| () gloomy | () competent |
| () strong | () aristocrat |
| () wicked | () precise |
| () contented | () defiant |
| () reserved | () unfair |
| () tolerant | () pessimistic |
| () immature | () punctual |
| () idealistic | () inferior |

P W L

- () hostile
- () broad-minded
- () unscrupulous
- () bluffer
- () submissive
- () smart

APPENDIX :
STUDY HABITS INVENTORY

I N S T R U C T I O N S

In this inventory are given some statements to know about your distinctive study habits. You are requested to read each statement carefully and tick mark '✓' against those statements which best describe your own study habits. Put the sign of a tick mark '✓' against the maximum possible number of statements which fully describe your study habits.

Example :

1. I cannot study alone ✓

You can see from the above example that a tick mark has been put against statement 1.

All your responses will be kept strictly confidential and will be used only for research purposes. There is no time limit for completing this inventory but try to finish the task within the shortest possible duration.

There is no question of passing or failing in the test so do not worry on this account. Be honest and frank in identifying your actual study habits.

Do not write anything on this booklet. Mark your responses on the answer-sheet separately provided to you for this purpose.

Do not turn this page unless instructed to do so.

STUDY HABITS

1. I study regularly for several hours at a stretch.
2. I cannot study alone.
3. I study the questions prescribed in the guess papers for any examination.
4. I cannot study for long hours during my examination.
5. While studying, I want complete silence in my room.
6. I rely upon tuitions for getting good marks in examinations.
7. I prepare for my examinations by writing the material again and over in.
8. Time is no consideration while I am busy preparing for my examinations.
9. I cancel all other activities during examination days.
10. I prepare all questions for the examinations in detail.
11. I revise my syllabus a number of times before I am ready for the examinations.
12. I copy the necessary portion from the books for my examinations.
13. I do not consult keys and notes while preparing for my examination
14. I am very slow in my preparation for examinations.
15. I study one subject after the other without any gap or pause.
16. I study in the company of my friends.
17. I divide the complete syllabus into parts, then prepare each part thoroughly.
18. I concentrate on my studies at night.

40. I concentrate on my studies in the library.
41. I make notes with the help of my class teacher.
42. I regularly give my note book to my teacher for checking.
43. I revise my notes again and again to get good marks.
44. I prepare my notes on the basis of the guess papers.
45. I prepare notes on important topics only.
46. I confine my studies to limited books and topics, rather than to the whole course.
47. I prepare short and precise answers for the examinations.
48. I first draw the outline of questions and then expand them.
49. I feel bored when I have to study periods one after the other in my school.
50. I cannot do well in studies unless my class teacher pays special attention to me in the class.
51. I cannot study well when there is noise or disturbance outside my class.
52. I very often miss my classes because I find most subjects uninteresting.
53. I am very attentive to my teacher in the class so ~~that~~ I do not require extra coaching.
54. I do my homework very regularly.
55. I cannot fully understand my lessons unless my teacher puts questions to me.
56. I consider the classroom as the primary centre for obtaining knowledge.
57. I am very particular about my attendance, and do not miss any class

19. I prepare for all my examinations in advance.
20. While studying, I want that some elder person should sit by my side.
21. I read loudly while preparing for my examinations.
22. After absorbing the lesson, I write down the whole material immediately for better retention.
23. I study books other than the text books for examination.
24. I do not study in an uncongenial environment.
25. I concentrate on my studies while lying comfortably in my bed.
26. I do not relish the interference of anybody in my studies.
27. I cannot study for long while sitting at one place.
28. I devote maximum time towards studies at home.
29. I forget the subject matter frequently, and so I need many revisions.
30. I spend most of my time sitting in the library, reading books related to my course.
31. I make notes for examination purposes rather than reading from books.
32. I visit the library regularly to read books other than those related to my subjects.
33. I do not rely on the notes prepared by others for my study.
34. I read my subject very slowly to understand the matter fully.
35. Without a proper chair and table, I cannot study properly.
36. I copy from the notes of my class mates to prepare for a subject.
37. I study regularly without gaps in between.
38. I study along with my brothers and sisters.
39. I am not in the habit of making notes because it leads to cramming.

58. Unless I listen to my teacher's lecture from start to finish, I cannot follow my subject.
59. I can pull on with my studies even when I miss class for a few days.
60. I gain self confidence when I appear in my class/monthly class tests
61. I study in a well furnished classroom.
62. I easily forget the learned material so I need several revisions.
63. I first clearly learn my subject and then write it to retain it for a longer time.
64. I have prepared a time table for my home study and I study according to that time table.
65. I complete my whole syllabus in the holidays so I am free later.
66. I do not believe in studying hard throughout the year.
67. I follow the maxim "work while you work and play while you play" for my studies.
68. I plan my studies without consulting any body.
69. I do not want that any body should give me directions so far as my studies are concerned.
70. I have fixed my study hours according to the directions of my parents/tutor.
71. I divide my time table according to the difficulty of the subject, so that I pay more attention to the subjects in which I am weak.
72. I get good marks in the examinations only when my parents encourage me from time to time.
73. I do not study when I am not in a mood to study.
74. I read magazines rather than course books.
75. I only study on examination days.

76. I do not believe in extra reading.
77. I read for a short duration of time, and at home.
78. I only read at home what ever is prescribed in the syllabus.
79. I read only those subjects at home on which questions are to be asked by the teacher in the class next day.
80. I feel irritated when my teacher compels me to study.
81. I study on my own.
82. I do not waste my holidays in studying my class subjects.
83. I finish up my course before the preparatory holidays.
84. I am not in the habit of having tuition because it spoils one's own habit of reading.
85. I prepare all my subjects thoroughly so that I do not have to revise them off and on.
86. I understand my subjects only when I discuss it with my friends/teacher.
87. I never miss my class tests.
88. I study only those subjects in which I get good marks.
89. I look forward to having free periods in the school.
90. I am very much particular about my attendance.
91. I can concentrate on my studies nicely alone when there is complete silence.
92. I cannot understand the lesson unless my teacher writes the main points on the black board.
93. I always prepare notes in my own language after reading the concerned books.

94. I have fixed a place for my studies.
95. I cannot study when some one else is present by my side in the room.
96. I can concentrate on my studies only when soft music is on.
97. I do not revise the topic when I have learned it.
98. It makes no difference to me if the T.V. is on when I am studying.
99. I can study for a long time at a stretch.
100. I study at home once a day.
101. I do not read everyday instead, I read whenever I wish.
102. I study to make up my deficiency in different subjects.
103. I study in the company of my friends.
104. I cannot memorize the whole lesson in one sitting.
105. I have developed my own study pattern rather than what others follow.
106. I cannot read during late night hours.
107. What ever I learn, I first write it down in my notebook.
108. I read in early evening hours.
109. When my school is over, I sit in the library to prepare my notes.
110. I compare my notes from time to time with those of my class fellows and modify them accordingly.
111. I cannot study all subjects at one time.
112. I have my own style for preparing for my examinations.
113. When I study I do require some digression in the shape of novels.
114. I co-relate ideas and thoughts of my subjects with my experiences when I study.

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115. I finish my class work in the school.
116. While studying at home, I study sitting on the floor.
117. My attention wavers when my teacher continues his/her lecture for more than one period.
118. I never miss my class tests.
119. I hate reading magazines because they simply waste my time.
120. I can study only when I get a cup of tea/coffee.
121. I study for 3 days a week.
122. I do not memorize any of the topics. I simply understand them.
123. I am not in the habit of reading supplementary books.
124. I revise the topic taught by my teacher, till I have mastery over that topic.
125. Unless my teacher explains to me the lesson fully, I cannot prepare that chapter myself.
126. I cannot study on an empty stomach.
127. My speed for reading books is very slow.
128. I can explain the subject matter orally, but I cannot write it nicely.
129. I study only when some one asks me to study.
130. I read better while walking on the roof.
131. My handwriting is very poor.
132. I understand the subject matter only when my teacher explains it on the black board with diagrams.
133. I read better while walking in the room instead of sitting at one place.

134. I cannot pass in any of the class tests/examinations unless I copy from my notes.
135. I remain fully attentive when my teacher delivers lectures in the class.
136. I cannot study too many subjects at a time.
137. My class notes remain incomplete because my writing speed is very slow.
138. I do not prepare notes, I understand the subject directly from the class notes.
139. I do not like to study but my parents force me to study daily.
140. While I am busy in studying course books, I dislike talking.
141. I study better through audio-visual aids in the classroom.
142. Home work creates difficulty in my regular study for final examinations.
143. When I have a free period, I go and read some books in the library.
144. I re-write notes/answers to questions after corrections made by my teacher.
145. I prepare myself for the examination in the holidays before the examinations.
146. I have got too many course books issued from my library even though I do not get time to go through them.
147. I consult at least 2-3 books other than the text books prescribed in my syllabus for completing my home work.
148. I depend upon the notes given by my class teacher.
149. Even though I want to study every day, some how I postpone it for the next day.
150. I do not attend my class daily and yet I am able to complete my studies satisfactorily.

INTERPERSONAL RELATIONS INVENTORY

I N S T R U C T I O N S

In the following pages, are given some statements related to your interpersonal relations with your teachers, parents, brothers, sisters and friends.

You are requested to read each statement carefully. Against each statement, there are five categories in terms of which you can give your responses. These categories are :- (1) Always (A), (2) Frequently (F), (3) Occasionally (O), (4) Seldom (S), and (5) Never (N). You have to respond to each statement by putting a cross mark (X) in one of the five categories against that statement. Please remember that you have to categorise your statement keeping in view your actual interpersonal relations with your teachers, friends, parents and brothers and sisters respectively.

Example : On returning from my school my parents
receive me very affectionately.

A : F : O : S : N
X

As you can see, a cross mark has been put under "Always" in the above example, this means that the parents of the subject always receive him/her affectionately on returning from school.

Please be frank and honest in your responses. Do not leave any statement unmarked. Your responses are to be utilized for research purposes only. These will be kept strictly confidential.

Since no particular response is right or wrong, do not worry about passing or failing on the basis of your responses. We just want to know about your interpersonal relations with your teachers, friends, parents, brothers and sisters.

There is no time limit for the completion of the inventory but try to finish this task within the shortest possible duration.

Do not write anything on this booklet itself. Responses should be crossed on the answer sheet only.

CHILD PARENT INTERPERSONAL RELATIONS

On returning from school my parents receive me affectionately.

My parents encourage me to have many hobbies.

My parents are too busy to have free time for me.

I do not like to do anything without telling/discussing it with my parents.

My parents are not concerned even when I do something wrong/bad.

My parents allow me to buy books other than those of my subjects.

I like to tell all events/happenings of the day to my parents.

My parents give examples of other children to me to follow for improvement.

My parents show great concern for my well being.

I do not talk about my daily experiences to my parents.

My parents do not ask my opinion in important family matters.

My parents blame/scold me when I do something different and new.

My parents feel happy when I get a prize.

I like to spend most of my free time with my parents.

When I face any problem I like to discuss it with my parents.

My parents do not let me do anything independently.

My parents attend those functions in which I take part.

When I do something new or novel, my parents appreciate my efforts.

My parents gladly allow me to go on picnics/tours with my friends.

My parents encourage me to take part in extra-curricular activities at school.

Contd...

21. My parents insist on my choosing school subjects/vocational stream of their choice.
22. My parents do not mind my writing letters to pen-friends.
23. My views differ from those of my parents over most issues.
24. My parents do not want me to participate in social activities after school hours.
25. My parents give their maximum preference to me in all matters as compared to my brothers and sisters.
26. I miss my parent's company when they are not at home.
27. My parents tell me very interesting stories.
28. My parents take interest in completing my daily home work.
29. I feel that my parents hinder my normal work by their interference.
30. My parents do not do as much for me, as they do for my brothers and sisters.

TEACHER-PUPIL INTERPERSONAL RELATIONS

1. My teacher answers all my questions in the class.
2. I want to change my class to get rid of my teacher.
3. I cannot tolerate it when other students talk ill about my teacher.
4. My teacher is unable to understand my problems.
5. I enjoy the company of my teacher.
6. My teacher feels proud on my success and achievement.
7. My teacher gets irritated when I put questions to him/her in the class.
8. My teacher encourages me to restrict my reading to the text books alone.
9. Whenever I feel difficulty in understanding my subject, I do not feel shy in going to the house of my teacher.
10. My teacher ignores me even when I do something good in the class.
11. I want to change my section because I am not getting along with my teacher.
12. I forget everything I want to say in the presence of my teacher.
13. My teacher encourages me to take part in extra-curricular activities, like dramas, debates, music etc.
14. My teacher shows partiality towards me.
15. I do not wish my teacher in the school.
16. My teacher does not give me a chance to express my ideas.
17. My teacher punishes me without telling my faults.
18. I consider my teacher as my friend and guide.
19. My teacher does not lend his books to me when I need them.

20. I miss my teacher when she/he is on leave from the school.
21. My teacher joins me in playing when I am on the playground.
22. I discuss many things with my teacher after class/school.
23. My teacher gives me extra home work as compared to other students.
24. My teacher listens to me patiently when I say something.
25. My teacher encourages me very much in my studies.
26. I feel like expressing my ideas in the class room in the presence of my teacher.
27. Whenever I have any problems, I discuss ~~them~~^{them} with my teacher.
28. My teacher shows great concern for my well being.
29. I want my teacher to accompany us on picnics and tours.
30. I feel that my teacher has no interest in whatever I do.

FRIENDS INTERPERSONAL RELATIONSHIP

1. I enjoy my friends' company.
2. I do not like gossiping with my friends when they are free.
3. I consider my friends nearer to me than my brothers and sisters.
4. When my friends feel any difficulty in studies, I take pleasure in helping them.
5. I prefer to study with my friends after school.
6. My friends do not let me become their leader.
7. I like to change my friends after some time.
8. I enjoy the company of my friends while going to the cinema, picnics, dramas etc.
9. I am disturbed in my studies because of my friends.
10. I am scared of making new friends.
11. I like to engage my time in some useful activity rather than wasting my time with friends.
12. The more the friends, the more I like to remain in their company.
13. My friends in school tease me when I am praised for my good work.
14. I prefer the company of my friends to that of my brothers and sisters.
15. My friends appreciate me when I do something new/novel.
16. I feel really shy in the company of my friends.
17. I miss the company of my friends when I reach home.
18. I have many friends and I like them.
19. Most of my friends are junior to me in age.

20. I do not mind borrowing any books/articles from my friends.
21. I feel isolated in the company of my friends.
22. I cannot tolerate when my friends get rewards for something in which I helped them the most.
23. My friends do not co-operate with me.
24. My friends ~~are~~ generally older than me.
25. My friends cheat me.
26. I like to make friends of the opposite sex rather than of my own sex.
27. I fail to make friends.
28. My friends blame me for their mistakes/failures.
29. I discuss my personal problems with my friends.
30. When my friends criticize me, I do not tolerate it.

SIBILINGS INTERPERSONAL RELATIONS

1. I am nice to my brothers and sisters.
2. I discuss my personal problems with my brothers and sisters.
3. I am jealous of my brothers and sisters.
4. I do not spend time with my brothers and sisters as they do not understand me.
5. My brothers and sisters get more love from my parents than myself.
6. I do not want to share my ideas with my brothers and sisters.
7. My brothers and sisters feel shy in discussing their personal problems with me.
8. When I am scolded by my parents, my brothers and sisters laugh and make fun of me.
9. After school when I reach home, I look forward to telling the happenings/events of the day to my brothers and sisters.
10. I do not mind borrowing books and other belongings etc. of my brothers and sisters.
11. When my brothers and sisters ask me to do something, I willingly do it.
12. I cannot tolerate the praise of my brothers and sisters by others.
13. I miss the company of my brothers and sisters when they are not at home.
14. When I do something new and novel, my brothers and sisters are happy.
15. I like to visit the homes of my friends or relatives along with my brothers and sisters.

16. I remember to wish my brothers and sisters on their birthdays.
17. My brothers and sisters interfere with my work.
18. We brothers and sisters play together.
19. I do not tell my brothers and sisters whenever I do something new/novel.
20. My sisters and brothers are fond of me.
21. My brothers and sisters do not mind wearing my clothes.
22. I like the company of my elder brothers and sisters rather than of those younger to me.
23. My brothers and sisters are jealous of me.
24. I feel happy at the success of my brothers and sisters.
25. I do not quarrel with my brothers and sisters.
26. I have better understanding and relations with my brothers rather than with my sisters.
27. I consider myself superior to my brothers and sisters in all respects.
28. I like to attend functions in which my brothers/sisters take part.
30. I feel that I am not getting proper love and affection from my brothers and sisters.

MIER VOCATIONAL CHECKLIST

S.NO.	VOCATION	S.NO.	VOCATION
1.	Accountant	34.	Physical Instructor
2.	Watch Repairer	35.	Beautician
3.	Army Officer	36.	Weather Observer
4.	Customs & Excise Officer	37.	Airconditioning Engineer
5.	Dry Cleaner	38.	Botanist
6.	Historian	39.	Auditor
7.	Fisherman	40.	Color Manufacturer
8.	Legal Advisor	41.	Workshop Owner
9.	Film Director	42.	Linesman
10.	Photographer	43.	Income Tax Advisor
11.	Research Scholar	44.	Plastic Goods Manufacturer
12.	Statistician	45.	Industrial Manufacturer
13.	Actor / Actress	46.	Tailor
14.	Book Publisher	47.	Political Leader
15.	Astrologer	48.	Weaver
16.	Cloth Merchant	49.	Airforce Officer
17.	Economist	50.	Brick Manufacturer
18.	Fitter	51.	Author
19.	Leather Goods Manufacturer	52.	Commercial Artist
20.	Motor Mechanic	53.	Dance Master
21.	Lecturer	54.	Electroplater
22.	Pharmacist	55.	Mason
23.	Restaurant Manager	56.	Industrial Engineer
24.	Indian Administrative Service (I.A.S.)	57.	Critic
25.	Stenographer	58.	Poet
26.	Advertising Agent	59.	Salesman/girl
27.	Book Seller	60.	Welder
28.	Athletic Coach	61.	Wholesale Dealer
29.	Clothes Designer	62.	Sanitary Inspector
30.	Editor	63.	Teacher
31.	Cycle Repairer	64.	Private Secretary
32.	Interpreter	65.	Musician
33.	Tourist Guide	66.	Psychologist
		67.	Embroiderer

Contd..._

S.NO.	VOCATION	S.NO.	VOCATION
68.	Decorator	101.	Office Secretary
69.	Painter	102.	Sheep Breeder
70.	Radio Announcer	103.	Purchasing Agent
71.	Automobile Dealer	104.	Novelist
72.	Fruit Vegetable Growing Business	105.	Jeweller
73.	Gate Keeper	106.	Craftsman
74.	Baker	107.	Financial Controller
75.	Carpenter	108.	Cartographer
76.	Labourer	109.	Bank Officer
77.	Catcher	110.	Acroplane Pilot
78.	Estate Agent	111.	Glass Manufacturer
79.	Social Worker	112.	Wireless Operator
80.	Judge	113.	Gold Smith
81.	Musical Instruments maker and Repairer	114.	Anthropologist
82.	Psychiatrist	115.	Guard
83.	Telegraphist	116.	Librarian
84.	Saw Mill Operator	117.	Biologist
85.	Indian Foreign Services (I.F.S.)	118.	Chemist & Druggist
86.	Metallurgist	119.	Drawing Teacher
87.	Examiner	120.	Cook
88.	Dental Surgeon	121.	Journalist
89.	Bus/Rail Conductor	122.	Nurse
90.	Card Board Manufacturer	123.	Ranger
91.	Band Master	124.	Writer
92.	Air hostess/Steward	125.	Minerologist
93.	Wine Maker	126.	Farmer
94.	Geographer	127.	Indian Police Service (I.P.S.)
95.	Wine Merchant	128.	Fashion Artist
96.	Bank Cashier	129.	Professional Player
97.	Carpenter	130.	X-Ray Technician
98.	Detective	131.	Zoologist
99.	Confectioner	132.	Finger Print Expert
100.	Factory Foreman/Inspector	133.	Miner
		134.	Aircraft Designer
		135.	Soap Maker

Contd ...

S.NO.	VOCATION	S.NO.	VOCATION
136.	Sports/Material Manufacturer	171.	Transporter
137.	Toy Maker	172.	Timber Merchant
138.	Reporter	173.	Businessman
139.	Labour Officer	174.	Naval Officer
140.	Truck Driver	175.	Block Maker
141.	Laboratory Assistant	176.	Peon
142.	Import/Export Business	177.	Doctor
143.	Cosmetics Manufacturer	178.	Veterinary Doctor
144.	Boarding House Keeper	179.	Shopkeeper
145.	Cinema Operator	180.	Bio-Chemist
146.	Child Welfare Worker	181.	Bio-Physicist
147.	Archæologist	182.	Television Artist
148.	Hair Dresser	183.	Computer Technician
149.	Cinematographer	184.	Personal Manager
150.	Handicrafts Teacher	185.	Chtd. Accountant
151.	Circus Artist	186.	Security Officer
152.	Shepherd	187.	Dairy Farmer
153.	Curator of Museum	188.	Poultry Farmer
154.	Architect	189.	Magician
155.	Patwari	190.	Industrialist
156.	Traffic Checker	191.	Music Director
157.	Paper Merchant	192.	Overseer
158.	Travel Agent	193.	Compounder
159.	Dramatist	194.	Horticulture Officer
160.	Statue Maker	195.	Wrestler
161.	Fireman	196.	Commission Agent
162.	Hardware Dealer	197.	Engineer
163.	Attendant	198.	Scientist
164.	Health Officer	199.	Astronaut
165.	Clerk	200.	Hunter
166.	Cloth Manufacturer	201.	Astronomer
167.	Hotel Receptionist	202.	Anesthetist
168.	Lawyer	203.	Electrician
169.	Radio Singer	204.	Religious Preacher
170.	Waiter	205.	Boxer

Contd...

S.NO.	VOCATION
206.	Stock broker
207.	Fighter Pilot
208.	School/College Principal
209.	Pop music Star
210.	Physiotherapist
211.	Pearl Diver
212.	Commentator
213.	TV/Radio Repairer
214.	Smuggler
215.	News Reader on T.V./Radio
216.	Sales Representative
217.	Indian Revenue Service
218.	Company Secretary
219.	Modelling
220.	Computer Programmer.

CONFIDENTIAL

A GROUP TEST OF GENERAL MENTAL ABILITY (1-78)

[A Point Scale for Adults.]

by

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A Group-test of General Mental Ability (1-78)

Do not write anything on this booklet, nor mark it in anyway.

All your answers go on the Answer Sheet.

++ ++

DIRECTIONS

This is a test of General Mental Ability. You will have 25 minutes to do it. There are 5 pages of this test with 100 questions. Examples of the various types of problems set in this test will be explained to you before you start on the Test Proper. All questions are in simple language. In all cases alternative answers are given, and what you have to do is simply to choose the right answer, and write its number on the Answer Sheet. Thus the answer to each question is always a number. So there is not much writing work to be done. There is only one correct answer to each question and each correct answer carries one mark. Time is rather short, and it is very rare for a person to complete all the test. So you should work very quickly and solve accurately as many as you can. Hence, if you find any problem to be too difficult for your type of knowledge, then do not spend much time over it and you may pass on to the next one.

Start when you are told, and go on as fast as you can

++ ++

**Do not write anything on this booklet
nor MARK it in any way.**

Now turn over and see the EXAMPLES on the problems set in the test.

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Examples for Practice

Answers are given in the Answer Sheet, *Classroom Examples*

A few examples of the type of questions which will be asked in the examination are given on the *Answer Sheet*

Now let us try these Examples

1. 3, 4, 5, 6, 7 What number comes next?
(1) 8, (2) 7, (3) 6, (4) 5, (5) 4
2. Rich means the *same* as—
(1) Big, (2) Healthy, (3) Wealthy, (4) Old, (5) Sick
3. Find the sum of the two *smaller* numbers among these numbers: 4, 3, 5
(1) 6, (2) 4, (3) 8, (4) 1, (5) 2
4. Thick means the *opposite* of—
(1) Buck, (2) Thin, (3) Skin, (4) Thin, (5) Soft
5. If a *kitten* is smaller than its mother write the figure of 8. Otherwise write the figure 4.
(1) 8, (2) 4, (3) 8, (4) 4, (5) 8
6. Which of these five is *different* from the rest?
(1) Sweet, (2) Red, (3) Yellow, (4) Blind, (5) Green
7. A boy is to a girl as a man is to—
(1) Can, (2) Furl, (3) Woman, (4) Child, (5) Toy
8. Three pillars, A, B and C are standing in a row. B is on the left of A and C on the right of A, which pillar is in the middle?
(1) A, (2) B, (3) C
9. The game of *cricket* is *more* expensive than the game of *hockey*. The game of *football* is *less* expensive than the game of *hockey*. If the game of *cricket* be more expensive than the game of *hockey* then which of these is the game of *tennis* which of these is the game of *tennis*?
(1) Cricket, (2) Hockey, (3) Football, (4) Badminton, (5) Tennis
10. *Trees* are useful to us, because—
(1) they have leaves.
(2) they provide us with wood.
(3) birds sit upon them.

you may ask questions you like and remove all your doubts now.

Please do not

turn this page until

you are told to do so

Test Proper

All answers go on Answer Sheet Column Page 1.

1. Asleep mean the *opposite* of—
(1) Dreaming. (2) Awake. (3) Leap. (4) Red. (5) Astern. 1
2. Money is useful to us, because
(1) it is made of silver.
(2) it can be easily carried in a purse.
(3) it can be put into a bank
(4) it can be exchanged for the goods we need. 2
3. War means the *opposite* of—
(1) Agree. (2) Wager. (3) Peace. (4) Number. (5) Dark. 3
4. Rats are very dangerous to us because
(1) they are common carriers of plague germs.
(2) they frighten us in the dark.
(3) they dig holes in our houses
(4) they bite persons who sleep on the floor. 4
5. Weather means the *same* as—
(1) Heater. (2) Whether. (3) Climate. (4) Wealth. (5) Weasel. 5
6. Grass is to green as rose is to—
(1) Lotus. (2) Blue. (3) Cow. (4) Red. (5) Jasmine. 6
7. Which one of these five is *different* from the rest?
(1) Grapes. (2) Lemons (3) Apples. (4) Oranges. (5) Sweets. 7
8. Short is to tall as day is to—
(1) Sport. (2) Night. (3) Tail. (4) Light. (5) Work 8
9. 18. 16. 14. 12. 10. What number comes next?
(1) 12. (2) 10 (3) 14. (4) 8. (5) 6. 9
10. Quarrel means the *same* a
(1) Fight. (2) Right. (3) Jealousy. (4) Enemies. (5) Friends 10
11. Krishna is taller than Gopal. Suresh is shorter than Krishna. Who is the tallest?
(1) Krishna. (2) Gopal. (3) Suresh. (4) Ram. 11
12. Which one of these five is *different* from the rest?
(1) Merchant. (2) Hindu. (3) Christian. (4) Muslim. (5) Bombay. 12
13. Camel is to desert as ship is to—
(1) Hump. (2) Oasis. (3) Sailor. (4) Sea. (5) Compass. 13
14. Which one of these five is *different* from the rest?
(1) Dog. (2) Crow. (3) Bullcock. (4) Fox (5) Horse. 14
15. Mr. Tom is wiser than his son Dick. Mary is duller than her mother Mrs. Tom.
Mr. Tom is wiser than Mrs. Tom. Who is the wisest?
(1) Mr. Tom. (2) Dick. (3) Mary. (4) Mrs. Tom. 15
16. Which one of these five is *different* from the rest?
(1) Cock. (2) Pigeon. (3) Crow. (4) Cat. (5) Dove. 16
17. 3. 5. 7. 9. 11. What number comes next?
(1) 12. (2) 13. (3) 10. (4) 2. (5) 15. 17
18. We should not beat and hurt others, because—
(1) we are cultured human beings.
(2) we may be hurt in the process
(3) medical aid is not readily available
(4) beating is usually unconvincing. 18
19. 4. 13. 22. 31. 40. What number comes next?
(1) 47. (2) 51. (3) 49. (4) 31. (5) 53. 19
20. Coarse means the *opposite* of—
(1) Source. (2) Colour. (3) Fine. (4) Court. (5) Grain. 20

Now go on to the top of Page 2)

All answers go on Answer Sheet Column Page 2.

21. A Cow is to a Calf as goat is to—
(1) Horse, (2) Sheep, (3) Puppy, (4) Kid, (5) Dog. 21
22. Dull means the *opposite* of—
(1) Bright, (2) Work, (3) Earn, (4) Dead, (5) Dreadful. 22
23. Which one of these five is *different* from the rest?
(1) Factory, (2) Temple, (3) Office, (4) Work-shop, (5) Foundry. 23
24. If a *man's* younger brother is younger than his father write the figure 5, if not then write figure 6. 24
25. Which one of these five is *different* from the rest?
(1) Tea, (2) Coffee, (3) Lemonade, (4) Toast, (5) Sodawater. 25
26. 4, 8, 16, 32, 64. What number comes next?
(1) 65, (2) 96, (3) 80, (4) 48, (5) 128. 26
27. If a *mis* has greater responsibility than an *engineer* write the figure 4, if not then write the figure 7. 27
28. Peace is to white as war is to—
(1) Soldier, (2) Snow, (3) Black, (4) Business, (5) Church 28
29. Write the figure of 6, if the *double* of five is equal to nine, if not and the *half* of eight is four, then write figure 5 otherwise write figure 4. 29
30. Which one of these five is *different* from the rest?
(1) Customer, (2) Clerk, (3) Manager, (4) Peon, (5) Director. 30
31. If a *captain* is more important than the *sergeant*, write the figure 3, if not then write the figure 4. 31
32. The river *Amazon* is *longer* than the river *Nile*. The river *Sind* is *shorter* than the river *Nile*; but the river *Nile* is *longer* than the river *Ganges*. The river *Ganges* however, is *shorter* than the river *Sind*. Which of these is the *shortest*?
(1) Amazon, (2) Nile, (3) Sind, (4) Ganges. 32
33. Write on the answer sheet the figure of 7, if the month of *July* comes before the month of *May*, but if the month of *March* comes before the *former* write the figure 6. 33
34. Add the two *larger* numbers and divide the result by the *smallest* of these numbers : 6, 3, 9.
(1) 2, (2) 1, (3) 18, (4) 3, (5) 5. 34
35. *Grapes* are *sweeter* than *mangoes*. *Apples* are *sweeter* than *oranges*. *Mangoes* are *sweeter* than *apples*. Which is the *sweetest* fruit?
(1) Grapes, (2) Mangoes, (3) Apples, (4) Oranges 35
36. If today is *Sunday* write the figure 7 but if not and *Friday* comes before *Wednesday* write the figure 8 however if *Tuesday* comes after *Monday* write the figure 4. 36
37. Man is to mouth, as bird is to—
(1) Hands, (2) Claws, (3) Beak, (4) Eyes, (5) Wings. 37
38. If the month of *October* comes after *November*, write the figure 8, but if the month of *September* comes before *August* write the figure 9, otherwise write 7, 38
39. *Buying* is to *selling* as *spending* is to—
(1) Surplus, (2) Essentials, (3) Building, (4) Saving, (5) Luxury. 39
40. Which one of these five is *different* from the rest?
(1) Soda-Fountain, (2) Restaurant, (3) House, (4) Hotel, (5) Coffee-House 40

(Time is short.

Turn over to the top of Page 3)

All answers go on Answer Sheet Column Page 3.

41. The *Pear's Cyclopaedia* is lighter than the *Oxford Dictionary*.
The *Chamber's Dictionary* is lighter than *Bhargava's Dictionary*.
The *Oxford Dictionary* is equal to *Chamber's Dictionary*. Which is the lightest Dictionary?
(1) *Pear's Cyclopaedia*, (2) *Oxford Dictionary*, (3) *Chamber's Dictionary*, (4) *Bhargava's Dictionary*. 41
42. Hand is to Fingers as Foot is to—
(1) Leg, (2) Nails, (3) Arm, (4) Toes, (5) Soles 42
43. Multiply the largest number by the difference between the two smaller ones among these numbers 1, 8, 3.
(1) 32, (2) 48, (3) 24, (4) 8, (5) 16. 43
44. 23, 18, 14, 11, 9. What number comes next?
(1) 8, (2) 11, (3) 4, (4) 7, (5) 10. 44
45. Goad means the same as—
(1) Goad, (2) Loan, (3) Cry, (4) Grop, (5) Allean. 45
46. 5, 12, 18, 23, 27. What number comes next?
(1) 30, (2) 28, (3) 26, (4) 31, (5) 34. 46
47. Which one of these five is different from the rest?
(1) Running, (2) Jumping, (3) Shipping, (4) Dancing, (5) Skating. 47
48. 5, 13, 22, 32, 43. What number comes next?
(1) 44, (2) 53, (3) 51, (4) 55, (5) 52. 48
49. If the rain falls before the clouds come write on your answer sheet the figure 4, but if it is the heat of the sun that helps the formation of clouds write the figure 5, otherwise simply write the figure 6. 49
50. Tax means the same as—
(1) Money, (2) Interest, (3) Levy, (4) Income, (5) Debt. 50
51. Nose is to tongue as smelling is to—
(1) Hearing, (2) Eyes, (3) Touching, (4) Roses, (5) Smell. 51
52. Which one of these five is different from the rest?
(1) Simla, (2) Darjeeling, (3) Gaya, (4) Mahabaleshwar, (5) Dooly. 52
53. Principle means the same as—
(1) Moral, (2) Law, (3) Princely, (4) Multiple, (5) Principle. 53
54. Valour means the opposite of—
(1) Pacific, (2) Glamour, (3) Cowardice, (4) Virtue, (5) Slavery. 54
55. Oranges are prescribed for the sick, because—
(1) they contain vitamin C,
(2) they are pleasing in colour
(3) they provide vegetable food to the patient
(4) they are sweet fruits 55
56. Final means the opposite of—
(1) Vernal, (2) Critical, (3) Finest, (4) Ultimate, (5) Original. 56
57. Which one of these five is different from the rest?
(1) Rice, (2) Leaves, (3) Fruits, (4) Disculia, (5) Toast. 57
58. 4, 8, 24, 96. What number comes next?
(1) 97, (2) 288, (3) 480, (4) 324, (5) 192. 58
59. We have four wooden poles, A, B, C and D. If A is longer than C, B is smaller than D and C is longer than D, which is the smallest pole?
(1) A, (2) B, (3) C, (4) D. 59
60. 2, 5, 11, 20, 32. What number comes next?
(1) 47, (2) 44, (3) 33, (4) 38, (5) 35. 60

(Time is short.)

Turn over to the top of Page 4)

225

81. Which one of these five is *different* from the rest?
(1) Reading. (2) Acting. (3) Singing. (4) Jesting. (5) Playing. 81
82. Reverence means the *opposite* of—
(1) Inference (2) Disobedience. (3) Riverina. (4) Honour. 82
83. Opulence means the *same* as—
(1) Populous. (2) Oppure. (3) Generosity. (4) Wealth. (5) Balance. 83
84. Which one has five is *different* from the rest?
(1) Accepting (2) Receiving (3) Giving (4) Paying (5) Buying. 84
85. If T. is smaller than W, then which of the figures is *less* than the figure 7, unless K is smaller than W, then which of the figures is *less* than the figure 8. 85
86. Which one of these five is *different* from the rest?
(1) Sleeping (2) Hoping (3) Running (4) Working. 86
87. School is to workshop as student is to—
(1) Teacher (2) Engineer (3) Machine (4) Wages. 87
88. Write down the *largest* number which is *less* than 100, but *more* than it gives a picture of a *great* by one of the—
(1) 4. (2) 6. (3) 10. (4) 3. 88
89. Dog is to horse as kitten is to—
(1) Puppy. (2) Child. (3) Goat. (4) Race. (5) Stable. 89
90. Salient means the *same* as—
(1) Saline (2) Lenient (3) Merciful (4) Outstanding. (5) Agreeable. 90
91. Vigorous is to cheering as beauty is to—
(1) Youth (2) Attractive (3) Repulsive (4) Attracting. (5) Aggressive. 91
92. Hydro electric projects are popular among the—
(1) people wish to make electrical appliances.
(2) it is possible to build very high dams.
(3) young men can easily learn electricity.
(4) coal mining is distasteful to labour. 92
93. Five labourers A, B, C, D, and E, are employed in a certain field. The speed of A's work was *faster* than E's work. B's work was *twice* as fast as D's speed, but *less* than C's speed. D's speed was *twice* as fast as E's speed and *three* times as fast as A's speed. Which of the *fastest* worker?
(1) A. (2) B. (3) C. (4) D. (5) E. 93
94. Subtle means the *same* as—
(1) Shrewd (2) Mysterious. (3) Bold (4) Sly (5) Shaky 94
95. If Q comes before L with one hour, then L comes before G with one hour, figure 6 unless S comes after L in which case it will be 10. 95
96. Cricket is to huddling as tennis is to—
(1) Sport. (2) Individual (3) Running (4) Hoping (5) Dispire 96
97. 1. 5 3. 6. 5. 7. What number comes next?
(1) 6. (2) 5. (3) 4. (4) 3. (5) 7 97
98. Wary means the *opposite* of—
(1) Foolhardy. (2) Hairy. (3) Warring (4) Bold (5) Dependence. 98
99. I went to the market to see *rain* but I saw *nothing*. I bought a *radio*, a *bicycle*, and a *car*. The cost of the *radio* was *less* than the cost of the *bicycle*, but *two* times as much as the cost of the *car*. The cost of the *car* is *three* fourth of the *bicycle*. If the *pen* cost is *more* than the *bicycle* and *two* third of the *book* which of these is the *cheapest*?
(1) Book (2) Radio. (3) Bicyclet. (4) Car. (5) Pen. 99
100. A *half* yearly payment of Rs. 200/- with a *half* yearly rate of Rs. 50/- is—
(1) Lower than; (2) The same as. (3) Higher than. 100

(If you have time, go back and improve your work)

THE END.

HIGH TESTS OF CREATIVITY.VERBAL TESTS OF CREATIVITY.

कृपया नीचे दिये गये खाली स्थानों को भरें :-

नाम _____ आयु १ साल _____ महिने _____ १

कक्षा _____ लिंग _____

विद्यालय _____ तिथि _____

"निर्देश"

इस पुस्तिका में आपको बहुत से मनोरंजक रुचिकर तथा सूचनात्मक कार्य करने होंगे, अपनी कल्पना शक्ति पैनी बुद्धि तथा मौलिकता, से अधिक से अधिक ऐसे उत्तर तथा विचार लिखने का प्रयत्न करें जो बहुत रौचक, नवीन, कल्पना शक्ति वाले व अच्छे हों तथा जिन्हें आपके विना कोई और न सोच सके ।

1. किसी भी उत्तर को सही अथवा गलत मान कर निर्णय नहीं किया जायेगा । इस लिए अपने उत्तरों के गलत या सही होने के बारे में पहले से ही न सोचें ।
2. प्रत्येक कार्य के लिये एक समय अवधि निश्चित है । इसलिये समय नष्ट न करें । शीघ्रता पूर्वक कार्य करें । सभी उत्तर सोच समझ कर, कल्पना करके, अच्छे तथा नवीन ढंग से अधिक से अधिक तथा बढ़िया देने का प्रयत्न करें ।
3. यदि किसी कार्य को करने में कठिनाई आ रही हो तो आप शिष्ट से सहायता ले सकते हैं । परन्तु प्रयास करें कि आम यह सहायता कम से कम ले ताकि आप का समय नष्ट न हो । अतः निर्देशों को भली प्रकार समझ कर कार्य शुरू करें ।
4. निश्चित समय से पहले यदि आप अपना कार्य समाप्त कर लेते हैं तो भी आप दूसरा पृष्ठ न देखें । यदि अतिरिक्त समय में कोई पहले से भी अच्छा उत्तर सुझे तो उसे लिख सकते हैं ।
5. जब तक आपको आदेश न दिया जाये, कृपया अपना पृष्ठ न मोड़ें ।

आप अपने मित्र राम के घर दावत जाने जा रहे हैं । तब आप उसके घर के पास पहुँचते हैं तो आपको उसके घर से कुछ छुंछा उठ रहा है । आप सोचने लगे क्या कारण हो सकता है कि राम के घर से छुंछा उठ रहा है ।

नीचे के गाली स्थान में अधिक से अधिक कारण लिखें कि राम के घर से छुंछा क्यों उठ रहा था । ध्यान रहे कि कारण रौचक, नवीन, तद्व्युक्त तथा बुद्धिमत्ता वाले हों जिन्हें आप के बिना कोई और सोच न सके ।

॥ समय 5 मिनट ॥

राम के घर से छुंछा उठने के कारण

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19.

मान लो कि गहनद्वी जहाज से यात्रा करते करते आप किसी बिल्बुल नये टापू में पहुँच गये हों जहाँ पहुँचने वाले आप ही पहले और अकेले व्यक्ति हों । अपनी कल्पना शक्ति सृष्टि और अनुभव की सहायता से लिखें कि उस टापू पर पहुँच कर आप कौन कौन से काम करेंगे । ध्यान रखें कि आप के उत्तर अलग अलग टंग के तथा ऐसे नवीन प्रकार के हों जिनकी आपकी कल्पना कोई और न सोच सके । अधिक से अधिक उत्तर देने का प्रयत्न करें ।

अपने उत्तरों की प्रमाणितता लिखें ।

॥ समय 5 मिनट ॥

जब तक साम को आदेश न दिया जाये कृपया अगला पृष्ठ न खोलें ।

टापू पर पहुँच कर आप कौन कौन से काम करेंगे ।

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आम को किसी प्रकार इस बात का पता है कि रात को कुछ डाकू आपके पड़ोसी के घर चला राहेंगे ? आप यह बात गुप्त रूप से पुलिस को बताना चाहते हैं ? नीचे लिखें कि रात को ऐसी विचित्र नवीन तथा गुप्त भाषा में लिखें कि इस विचित्र नवीन तथा गुप्त भाषा में लिखें कि इस विचित्र भाषा को कैसे पता जा सकता है ?

॥ समय 5 मिनट ॥

आज रात डाकू के मोराम के घर डाका डालेंगे ।

1. गुप्त रूप से पत्र नीचे वाले स्थान में लिखें ।

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संकेत :- उत्तर दिये गए पत्र को किस प्रकार पढ़ें ?

नीचे दिये गए स्थान में लिखें ।

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अक्षरों से शब्द बनाएँ

1. उल्टे सोचे एक समान हों ।
2. भिन्नता यदि एक अक्षर काट दें वह किसी अंग्रेजी भाषा का शब्द बन जाए

उल्टे सोचे एक समान शब्द नीचे लिखें

अक्षर भिन्नता एक अक्षर काटा जाए तो अंग्रेजी भाषा का शब्द बन जाए

WIRE TESTS OF CREATIVITY
NON-VERBAL TESTS OF CREATIVITY

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खाली नीचे दिये गये खाली स्थानों को भरें :-

नाम ----- आयु ----- कक्षा -----

लिंग ----- विद्यालय ----- तिथि -----

" निर्देश "

इस पुस्तिका में आपको बहुत से मनोरंजक, रूचिकार तथा सृजनात्मक कार्य करने होंगे । अपनी कल्पना शक्ति पैनी ज़ुद्धि तथा मौलिकता से अधिक से अधिक बढ़िया चित्र, आकार अथवा आकृतियाँ बनाएँ जो बहुत नवीन, कल्पना शक्ति वाले व अमूर्त हों तथा जिन्हें आप के बिना कोई और न बना सके ।

1. किसी भी चित्र अथवा आकृति को सही अथवा गलत मान कर निर्णय नहीं किया जायेगा । इसलिए अपने चित्र अथवा आकृति के गलत अथवा सही होने के बारे में पहले से ही न सोचें ।
2. प्रत्येक कार्य करने के लिए एक समय अवधि निश्चित है इसलिए समय नष्ट न करें । जो प्रस्तावपूर्ण कार्य करें । सभी उत्तर सोच समझ कर कल्पना करके, अमूर्त तथा नवीन ढंग से दें । अधिक से अधिक तथा बढ़िया चित्र व आकृतियाँ बनाने का प्रयत्न करें ।
3. यदि किसी कार्य को करने में कठिनाई आ रही हो तो आप शिथिल से सहायता ले सकते हैं । परन्तु प्रयास करें कि आप यह सहायता कम से कम लें ताकि आपका समय नष्ट न हो । अतः निर्देशों का भली प्रकार समझ कर कार्य करें ।
4. निश्चित समय से पहले ही यदि आप अपना कार्य समाप्त कर लेते हैं, तो भी आप दूसरा पृष्ठ न देखें । यदि अतिरिक्त समय में कोई पहले से ज़े अथवा चित्र अथवा आकृति आपको सूझे तो, उसे बना सकते हैं ।
5. जब तक आपकी आदेश न दिया जाये, कृपया आला पृष्ठ न पलटें ।

मान लो कि आपके पास एक हजार ईट हैं उनमें से जितनी चाहें उतनी ईट माँगाहे परन्तु भिन्न 2 तंग से रखा कर अधिक से अधिक संख्या से चित्र बनाओ । ध्यान रहे

1. प्रत्येक चित्र एक दूसरे से भिन्न हो और ऐसा हो कि जिसको कोई दूसरा सोच भी न सके ।
2. आप हर एक चित्र में जितनी कम या अधिक ईट याहे प्रयोग कर सकते हैं ।
3. चित्र या आकृति किसी भी वस्तु की बनाई जा सकती है पर उसके नीचे चित्र का नाम अवश्य लिखें ।

॥ समय 5 मिनट ॥

जब तक आपको आदेश न मिले कृपया आला पृष्ठ न उलटें ।

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1	1

नीचे त्रैचो गहं तीन आकृतियाँ ॥ एक वर्ग, एक गोला तथा एक त्रिकोण ॥ का प्रयोग करके अपनी कल्पना से एक पुरुष या स्त्री का चित्र बनाएं ।

1. ध्यान रखें कि आप प्रत्येक आकृति का छोटा बड़ा तो कर सकते हैं परन्तु उसका रूप नहीं बिगाड़ सकते ।

2. पूरे चित्र में 12 से कम या अधिक आकृतियाँ न हों । हाँ आपको स्वतन्त्रता है कि आप किसी आकृति का एक से अधिक बार प्रयोग कर सकते हैं ।

॥ समय 5 मिनट ॥

"सामाजिक प्रतिक्रिया सूची"

इस प्रश्नावली का उद्देश्य यह ज्ञान कराना है कि कुछ महत्वपूर्ण सामाजिक चेतनाएँ भिन्न-भिन्न लोगों पर कैसा प्रभाव डालते हैं। हर एक प्रश्न के क तथा ख दो भाग हैं। कृपया हर प्रश्न का उत्तर देने के लिए उस प्रश्न के क या ख भाग में से केवल एक को ही चुनें जिस पर आप का अधिक विश्वास हो। क्या ख में से चुनते समय यह ध्यान रखें कि आप उस कथन को ही चुनें जिसको आप वास्तव में अधिक सत्यपूर्ण समझते हैं। यह न सोचिए कि कौन सा कथन सत्यपूर्ण होना चाहिये, बल्कि यह सोचिये कि आप के मत के अनुसार कौन सा कथन अधिक सत्यपूर्ण है। यह कोई उत्तर गलत नहीं है।

अपने उत्तर इस प्रश्नावली के उपर लगे "उत्तर-पत्र" पर ही दें। इस "उत्तर-पत्र" को अभी अलग कर लें। अपना नाम तथा दूसरी सूचनाएं दें। तब शेष निर्देशों को पढ़ें प्रश्नावली को तब तक न खोलें जब तक आपको ऐसा करने को कहा न जाये।

प्रत्येक प्रश्न का उत्तर ध्यानपूर्वक दें। परन्तु किसी एक प्रश्न पर ही बहुत समय न लगायें। हर प्रश्न का उत्तर अवश्य दें। उत्तर-पत्र पर प्रश्न नं. को देखकर क या ख में से जिस कथन को आप अधिक सत्यपूर्ण समझते हैं, उन पर ठीक का निशान लगायें। उत्तर केवल उत्तर-पत्र पर ही दें प्रश्नावली पर नहीं प्रश्नावली पर कोई निशान न लगायें।

कुछ प्रश्नों में शायद आपको ऐसा लगे कि क तथा ख दोनों ही कथन सत्यपूर्ण हैं। ऐसी दशा में भी प्रयत्न कीजिये कि आप उन दोनों में से भी एक चुनें जिसमें आप का अधिक दृढ़ विश्वास हो। हर प्रश्न का उत्तर अवश्य दें। तथा हर प्रश्न को एक दूसरे से अलग अलग समझकर उत्तर दें। आपमें पहिले प्रश्नों के कैसे उत्तर दिये हैं, इस का दूसरे प्रश्नों के उत्तरों पर कोई प्रभाव नहीं होना चाहिये।

याद रखें

प्रत्येक प्रश्न के लिये क या ख में से उस कथन को चुनें जिस पर आप का अधिक विश्वास हो।

मेरा दृढ़ विश्वास है कि :-

1. ॥ क॥ बच्चे इसलिये सुसीबत में पंखते हैं क्योंकि उनके माता पिता उन्हें बहुत दण्ड देते हैं ।
 ॥ ख॥ आजकल अधिकतर बच्चे इसलिये सुसीबत में पंखते हैं, क्योंकि उनके माता पिता उनके साथ बहुत नरमी ॥ सहज स्वभाव बरतते हैं ॥
2. ॥ क॥ लोगों के जीवन में बहुत से दुःख कुछ सीमा तक उनके दुर्भाग्य से आते हैं
 ॥ ख॥ लोगों के दुःख का कारण उनकी अपनी की हुई गस्तियां हैं ।
3. ॥ क॥ लोग सुखों को रोकने का कितना ही प्रयत्न करें सुख तो हमेशा होगा ही ।
 ॥ ख॥ सुख होने का एक मुख्य कारण यह है कि लोग राजनीति में पर्याप्त रुची नहीं लेते ।
4. ॥ क॥ अन्त में लोगों को इस संसार में वह सम्मान मिल ही जाता है जिसके वे योग्य होते हैं ।
 ॥ ख॥ दुर्भाग्यवश किसी व्यक्ति के गुणों को मान्यता नहीं मिलती, चाहे वह कितना कठोर परिश्रम करे ।
5. ॥ क॥ यह कलना व्यर्थ जो कि अध्यापक छात्रों के प्रति अन्याय करते हैं ।
 ॥ ख॥ अधिकतर छात्र यह नहीं जानते हैं कि अचानक होने वाली घटनायें उनकी परीक्षा परिणाम पर कितना प्रभाव डालती हैं ।
6. ॥ क॥ उचित ट्रेनिंग के बिना कोई भी प्रभावशाली नेता नहीं बन सकता है ।
 ॥ ख॥ योग्य व्यक्ति इसलिये नेता बनने से रह जाते हैं क्योंकि वे हाथ में आए अवसर का लाभ नहीं उठा सकते हैं ।
7. ॥ क॥ आप कितना ही प्रयत्न क्यों न करें कुछ लोग फिर भी आप को पसन्द नहीं करेंगे ।
 ॥ ख॥ लोग अपने को दूसरों में प्रिय इसलिये नहीं बना सकते क्योंकि उन्हें दूसरों के साथ रहना नहीं आता ।
8. ॥ क॥ हमारे व्यक्तित्व को जानने में गुरा परम्परागत गुणों का अधिक हाथ है ।
 ॥ ख॥ व्यक्ति अपने जीवन के अनुभवों से ही बनता या बिगड़ता है ।

9. [क] मैंने तो अक्सर यह देखा है कि जो होना होता है होकर ही रहता है ।
[अ] भाग्य पर विश्वास करने के बजाये एक क्रियाविधि से काम करने में मुझे अधिक लाभ रहा है ।
10. [क] पूरी तैयारी करने वाले छात्र के लिये शायद ही कोई परीक्षा अन्यायपूर्ण हो ।
[अ] प्रयः परीक्षा पत्रसिलवस के बाहिर से आते हैं, तथा पढाई करना पसंद है ।
11. [क] जीवन में समस्तता कठिन परिश्रम से मिलती है, भाग्य का इसमें कोई हाथ नहीं है ।
[अ] अच्छी नौकरी मिलना इस बात पर निर्भर करता है कि कोई व्यक्ति उचित समय पर उचित स्थान पर है या नहीं ।
12. [क] प्रत्येक साधारण नागरिक सरकार के फैसले को प्रभावित कर सकता है ।
[अ] इस संसार को तो थोड़े से शक्तिशाली व्यक्ति चला रहे हैं, तथा साधारण व्यक्ति की अधिक पूछ नहीं ।
13. [क] जब मैं कोई योजना बनाता हूँ मुझे पक्का विश्वास होता है कि मैं उसे कार्य रूप दे सकता हूँ ।
[अ] दूर भविष्य की योजनाएँ बनाने में कोई अक्लमन्दी नहीं क्योंकि कई बातें तो केवल भाग्य पर ही निर्भर होती हैं ।
14. [क] कुछ लोग तो बिल्कुल अच्छे नहीं होते ।
[अ] प्रत्येक व्यक्ति में कोई न कोई गुण अवश्य होता है ।
15. [क] मेरे लिये किसी भी चीज को जिसे मैं प्रयाप्त करना चाहता हूँ प्राप्त करना भाग्य पर निर्भर नहीं ।
[अ] कई बार हम सिक्का उवाँल कर भी ठीक फैसला कर सकते हैं ।
16. [क] अक्सर प्रायः वही व्यक्ति बनता है जो सौभाग्य से सब से पहिले ठीक स्थान पर काम कर रहा है ।
[अ] लोगों से ठीक काम करवाना व्यक्ति की योग्यता पर निर्भर है, भाग्य पर नहीं ।
17. [क] संसारिक मामलों में प्रायः हम सभी ऐसी शक्तियों का शिकार हो जाते हैं जिन को न ही हम समझ सकते हैं तथा न ही रोक सकते हैं ।
[अ] राजनैतिक तथा सामाजिक कार्यों में सक्रीय भाग लेकर सांसारिक गलतियों की रोक थाम की जा सकती है ।

मेरा दृष्टि विचार है कि :-

18. [क] अधिकतर लोग यह नहीं समझ पाते कि उनका जीवन अमानक होने वाली चटनाओं के वश में होता है ।
[न] "भाग्य" वास्तव में कोई चीज नहीं है ।
19. [क] मृत्यु को सदा सत्य अपनी भूलें स्वीकार करनी चाहिए ।
[न] यह साधारण तथा सब से उत्तम बात है कि मृत्यु अपनी भूलों को उधारे ।
20. [क] यह जानना बहुत कठिन है कि कोई व्यक्ति वास्तव में आपको पसन्द करता है या नहीं ।
[न] आपके मित्रों की संख्या आपके अच्छा होने पर निर्भर करती है ।
21. [क] अन्त में, हमारे दुःखों तथा सुखों का स्तुलन हो जाता है ।
[न] हमारे अधिकतर दुःख हमारी अयोग्यता अज्ञानता, और सुस्ती या इन तीनों ही चीजों का परिणाम है ।
22. [क] यदि प्रयाप्त प्रयत्न किया जाये तो हम राजनैतिक भ्रष्टाचार को समाप्त कर सकते हैं ।
[न] सरकार चलाने वाले राजनीतिज्ञों को कार्यों पर नियन्त्रण रखना लोगों के लिए बहुत कठिन है ।
23. [क] कई बार मैं यह नहीं समझ पाता कि अध्यापक किस प्रकार फैसला करते हैं कि कितने अंक किसी को मिलने चाहिए ।
[न] मुझे अंक मेरे परीक्षा के मुताबिक मिलते हैं । जितना कठोर परिश्रम मैं करता हूँ उतने ही अधिक अंक मुझे मिलते हैं ।
24. [क] एक अच्छा नेता हर व्यक्ति को यह स्पष्ट बता देता है कि उस व्यक्ति ने क्या करना है ।
[न] एक अच्छा नेता लोगों से यह आशा रखता है कि वे यह फैसला स्वयं करें कि उन्होंने क्या करना है ।
25. [क] कई बार मैं महसूस करता हूँ कि मेरे साथ होने वाली चटनाओं पर मेरा कोई प्रभाव नहीं ।
[न] मेरे लिये यह विश्वास करना असंभव है कि अवसर या भाग्य का मेरे जीवन में कोई महत्व है ।

मेरा दृष्टि विश्वास है कि

26. ❧क❧ लोग इस लिये अकेले रह जाते हैं क्यों कि वे मित्रता का पूरा व्यवहार करना चाहते हैं ।

❧ज❧ लोगों को खुश रखने के लिये अत्यधिक प्रयत्न करने का कोई लाभ नहीं यदि वे तुम्हें प्रसन्न करना चाहते हैं तो करते ही हैं ।

27. ❧क❧ हार्ड स्कूलों में ब्रेल कूट पर अत्यधिक ज़ार दिया जाता है ।

❧ज❧ टीम बना कर खेले जाने वाली खेलें चरित्र बनाने का उत्तम तरीका है ।

28. ❧क❧ जो छटनायें मेरे साथ होती हैं वह मेरे अपने ही किस्म के फूल हैं ।

❧ज❧ कई बार मैं सोचता हूँ कि मेरी जीवन जिस दिशा में जा रहा है उस पर पर्याप्त ध्यान नहीं है ।

29. ❧क❧ प्रायः मैं नहीं समझ पाता कि राजनीति क्यों इस प्रकार व्यवहार करते हैं

❧ज❧ अन्त में तो, राष्ट्रीय या स्थानीय सरकार का अच्छा या बुरा होने की जिम्मेवारी लोगों के ऊपर ही है ।

"सामाजिक प्रतिक्रिया सूची"

आप का नाम _____ स्कूल का नाम _____ तिथि _____
 योग्यता _____ आयु _____
 स्त्री / पुरुष _____ आप की जाति _____
 पिता / पति का व्यवसाय _____
 § मृतक या रिटायर हो तो पिछली व्यवसाय दीजिये §
 पिता / पति कितने पढ़े हुए हैं _____
 आप शहर से आते हैं या गांव से _____

प्रत्येक प्रश्न के सामने § क § या § ख § में से केवल एक पर ही ठीक § § का निशान लगाएं

प्रश्न न.			प्रश्न न.			प्रश्न न.		
1.	क	ख	11.	क	ख	21.	क	ख
2.	क	ख	12.	क	ख	22.	क	ख
3.	क	ख	13.	क	ख	23.	क	ख
4.	क	ख	14.	क	ख	24.	क	ख
5.	क	ख	15.	क	ख	25.	क	ख
6.	क	ख	16.	क	ख	26.	क	ख
7.	क	ख	17.	क	ख	27.	क	ख
8.	क	ख	18.	क	ख	28.	क	ख
9.	क	ख	19.	क	ख	29.	क	ख
10.	क	ख	20.	क	ख	30.	क	ख

RESPONSE SHEET FOR STUDY HABITS INVENTORY

Name _____ Age _____ Class _____

Sex _____ Date _____ School _____

NO. of Brothers _____ NO. of Sisters _____

Qualifications of Parents _____ Father _____ Mother _____

Joint or Single family _____

Income of Parents : Father _____ Mother _____

Hours of Study on Ordinary Days: _____

Hours of study on Examination days :-

Hours of study during vacation/holidays:-

S.NO.:	Responses	S.NO.:	Responses	S.NO.:	Responses	S.NO.:	Responses
1	: 0	: 21	: 0	: 41	: 0	: 61	: 0
2	: 0	: 22	: 0	: 42	: 0	: 62	: 0
3	: 0	: 23	: 0	: 43	: 0	: 63	: 0
4	: 0	: 24	: 0	: 44	: 0	: 64	: 0
5	: 0	: 25	: 0	: 45	: 0	: 65	: 0
6	: 0	: 26	: 0	: 46	: 0	: 66	: 0
7	: 0	: 27	: 0	: 47	: 0	: 67	: 0
8	: 0	: 28	: 0	: 48	: 0	: 68	: 0
9	: 0	: 29	: 0	: 49	: 0	: 69	: 0
10	: 0	: 30	: 0	: 50	: 0	: 70	: 0
11	: 0	: 31	: 0	: 51	: 0	: 71	: 0
12	: 0	: 32	: 0	: 52	: 0	: 72	: 0
13	: 0	: 33	: 0	: 53	: 0	: 73	: 0
14	: 0	: 34	: 0	: 54	: 0	: 74	: 0
15	: 0	: 35	: 0	: 55	: 0	: 75	: 0
16	: 0	: 36	: 0	: 56	: 0	: 76	: 0
17	: 0	: 37	: 0	: 57	: 0	: 77	: 0
18	: 0	: 38	: 0	: 58	: 0	: 78	: 0
19	: 0	: 39	: 0	: 59	: 0	: 79	: 0
20	: 0	: 40	: 0	: 60	: 0	: 80	: 0

S.NO.: Responses : S.NO.: Responses : S.NO.: Responses : S.NO.: Responses

81	:	0	:	101	:	0	:	121	:	0	:	141	:	0
82	:	0	:	102	:	0	:	122	:	0	:	142	:	0
83	:	0	:	103	:	0	:	123	:	0	:	143	:	0
84	:	0	:	104	:	0	:	124	:	0	:	144	:	0
85	:	0	:	105	:	0	:	125	:	0	:	145	:	0
86	:	0	:	106	:	0	:	126	:	0	:	146	:	0
87	:	0	:	107	:	0	:	127	:	0	:	147	:	0
88	:	0	:	108	:	0	:	128	:	0	:	148	:	0
89	:	0	:	109	:	0	:	129	:	0	:	149	:	0
90	:	0	:	110	:	0	:	130	:	0	:	150	:	0
91	:	0	:	111	:	0	:	131	:	0	:	:	:	
92	:	0	:	112	:	0	:	132	:	0	:	:	:	
93	:	0	:	113	:	0	:	133	:	0	:	:	:	
94	:	0	:	114	:	0	:	134	:	0	:	:	:	
95	:	0	:	115	:	0	:	135	:	0	:	:	:	
96	:	0	:	116	:	0	:	136	:	0	:	:	:	
97	:	0	:	117	:	0	:	137	:	0	:	:	:	
98	:	0	:	118	:	0	:	138	:	0	:	:	:	
99	:	0	:	119	:	0	:	139	:	0	:	:	:	
100	:	0	:	120	:	0	:	140	:	0	:	:	:	
	:		:		:		:		:		:	:	:	

RESPONSE SHEET FOR INTER-PERSONAL RELATIONS INVENTORY

Information to be filled in by the Students

1. Name _____ 2. Age: Years _____ Months _____
3. School _____ 4. Class _____
5. Date _____ 6. Joint/Single Family _____
7. Occupation of the parents (Mother) _____ (Father) _____
8. NO. of Brothers and Sisters (Elder) _____ (Younger) _____
9. Qualifications of the parents (Mother) _____ (Father) _____

SECTION A. C - P I R

S.N. : A : F : O : S : N : S.N. : A : F : O : S : N

1 : : : : : : 13 : : : : :

2 : : : : : : 14 : : : : :

3 : : : : : : 15 : : : : :

4 : : : : : : 16 : : : : :

5 : : : : : : 17 : : : : :

6 : : : : : : 18 : : : : :

7 : : : : : : 19 : : : : :

8 : : : : : : 20 : : : : :

9 : : : : : : 21 : : : : :

10 : : : : : : 22 : : : : :

11 : : : : : : 23 : : : : :

12 : : : : : : 24 : : : : :

S.N.	:	A	:	F	:	O	:	S	:	N	S.N.	:	A	:	F	:	O	:	S	:	N
25	:		:		:		:		:		28	:		:		:		:		:	
26	:		:		:		:		:		29	:		:		:		:		:	
27	:		:		:		:		:		30	:		:		:		:		:	

SECTION B. T-P I R

S.N.	:	A	:	F	:	O	:	S	:	N	S.N.	:	A	:	F	:	O	:	S	:	N
1	:		:		:		:		:		16	:		:		:		:		:	
2	:		:		:		:		:		17	:		:		:		:		:	
3	:		:		:		:		:		18	:		:		:		:		:	
4	:		:		:		:		:		19	:		:		:		:		:	
5	:		:		:		:		:		20	:		:		:		:		:	
6	:		:		:		:		:		21	:		:		:		:		:	
7	:		:		:		:		:		22	:		:		:		:		:	
8	:		:		:		:		:		23	:		:		:		:		:	
9	:		:		:		:		:		24	:		:		:		:		:	
10	:		:		:		:		:		25	:		:		:		:		:	
11	:		:		:		:		:		26	:		:		:		:		:	
12	:		:		:		:		:		27	:		:		:		:		:	
13	:		:		:		:		:		28	:		:		:		:		:	
14	:		:		:		:		:		29	:		:		:		:		:	
15	:		:		:		:		:		30	:		:		:		:		:	

SECTION C, F I R

S.N.	:	A	:	F	:	O	:	S	:	N	S.N.	:	A	:	F	:	O	:	S	:	N
1	:		:		:		:		:		16	:		:		:		:		:	
2	:		:		:		:		:		17	:		:		:		:		:	
3	:		:		:		:		:		18	:		:		:		:		:	
4	:		:		:		:		:		19	:		:		:		:		:	
5	:		:		:		:		:		20	:		:		:		:		:	
6	:		:		:		:		:		21	:		:		:		:		:	
7	:		:		:		:		:		22	:		:		:		:		:	
8	:		:		:		:		:		23	:		:		:		:		:	
9	:		:		:		:		:		24	:		:		:		:		:	
10	:		:		:		:		:		25	:		:		:		:		:	
11	:		:		:		:		:		26	:		:		:		:		:	
12	:		:		:		:		:		27	:		:		:		:		:	
13	:		:		:		:		:		28	:		:		:		:		:	
14	:		:		:		:		:		29	:		:		:		:		:	
15	:		:		:		:		:		30	:		:		:		:		:	

SECTION D. S.I.R.

S.N. :	A :	F :	O :	S :	N :	S.N. :	A :	F :	O :	S :	N :
1	:	:	:	:	:	16	:	:	:	:	:
2	:	:	:	:	:	17	:	:	:	:	:
3	:	:	:	:	:	18	:	:	:	:	:
4	:	:	:	:	:	19	:	:	:	:	:
5	:	:	:	:	:	20	:	:	:	:	:
6	:	:	:	:	:	21	:	:	:	:	:
7	:	:	:	:	:	22	:	:	U	:	:
8	:	:	:	:	:	23	:	:	:	:	:
9	:	:	:	:	:	24	:	:	:	:	:
10	:	:	:	:	:	25	:	:	:	:	:
11	:	:	:	:	:	26	:	:	:	:	:
12	:	:	:	:	:	27	:	:	:	:	:
13	:	:	:	:	:	28	:	:	:	:	:
14	:	:	:	:	:	29	:	:	:	:	:
15	:	:	:	:	:	30	:	:	:	:	:

For Scorer only

Summary

Over all

Score :	1	:	2	:	3	:	4	:	5
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RESPONSE SHEET FOR VOCATIONAL CHECK LISTInformation to be filled in by the student

1. Name.....2. Age(Year).....(Months)....
3. Sex.....4. Class.....5. Section.....
6. School.....7. Stream Medical/Non-Medical/Commerce/Arts/
H.Sec./Agri.
8. Qualification of Mother.....Father.....
9. Occupation of the Parents(1) Mother.....(2) Father.....
10. Whether both parents alive Mother(Yes or NO)Father (Yes or NO)

Directions :- Two hundred and twenty (220) important vocations have been included in this check list which you can choose after finishing your education. Please write any 10 of these professions in order of preference which you think you would like to select for your self after finishing your studies.

The information supplied by you shall be used for research purposes alone and shall be kept strictly confidential.

Order of Preference	Sr.NO.in Check list	Vocation	Order of Preference	Sr.NO.in Check List	Vocation
1	:	:	6	:	:
2	:	:	7	:	:
3	:	:	8	:	:
4	:	:	9	:	:
5	:	:	10	:	:

RESPONSE SHEET FOR GROUP TEST OF GENERAL MENTAL ABILITY

INFORMATION TO BE FILLED IN BY THE STUDENTS

NAME :

AGE :

SEX :

: Page 1		: Page 2		: Page 3		: Page 4		: Page 5	
: Q	: A	: Q	: A	: Q	: A	: Q	: A	: Q	: A
: 1	:	: 21	:	: 41	:	: 61	:	: 81	:
: 2	:	: 22	:	: 42	:	: 62	:	: 82	:
: 3	:	: 23	:	: 43	:	: 63	:	: 83	:
: 4	:	: 24	:	: 44	:	: 64	:	: 84	:
: 5	:	: 25	:	: 45	:	: 65	:	: 85	:
: 6	:	: 26	:	: 46	:	: 66	:	: 86	:
: 7	:	: 27	:	: 47	:	: 67	:	: 87	:
: 8	:	: 28	:	: 48	:	: 68	:	: 88	:
: 9	:	: 29	:	: 49	:	: 69	:	: 89	:
: 10	:	: 30	:	: 50	:	: 70	:	: 90	:
: 11	:	: 31	:	: 51	:	: 71	:	: 91	:
: 12	:	: 32	:	: 52	:	: 72	:	: 92	:
: 13	:	: 33	:	: 53	:	: 73	:	: 93	:
: 14	:	: 34	:	: 54	:	: 74	:	: 94	:
: 15	:	: 35	:	: 55	:	: 75	:	: 95	:
: 16	:	: 36	:	: 56	:	: 76	:	: 96	:
: 17	:	: 37	:	: 57	:	: 77	:	: 97	:
: 18	:	: 38	:	: 58	:	: 78	:	: 98	:
: 19	:	: 39	:	: 59	:	: 79	:	: 99	:
: 20	:	: 40	:	: 60	:	: 80	:	: 100	:

A _____

B _____

C _____

D _____

E _____

F _____

G _____

H _____

I _____

Column

Score :

No.	:	:	Education
1	:	:	Education